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Natural Resources of

INDIANA

Prepared by the - United States Department of the Interior - Stewart L. Udall, Secretary

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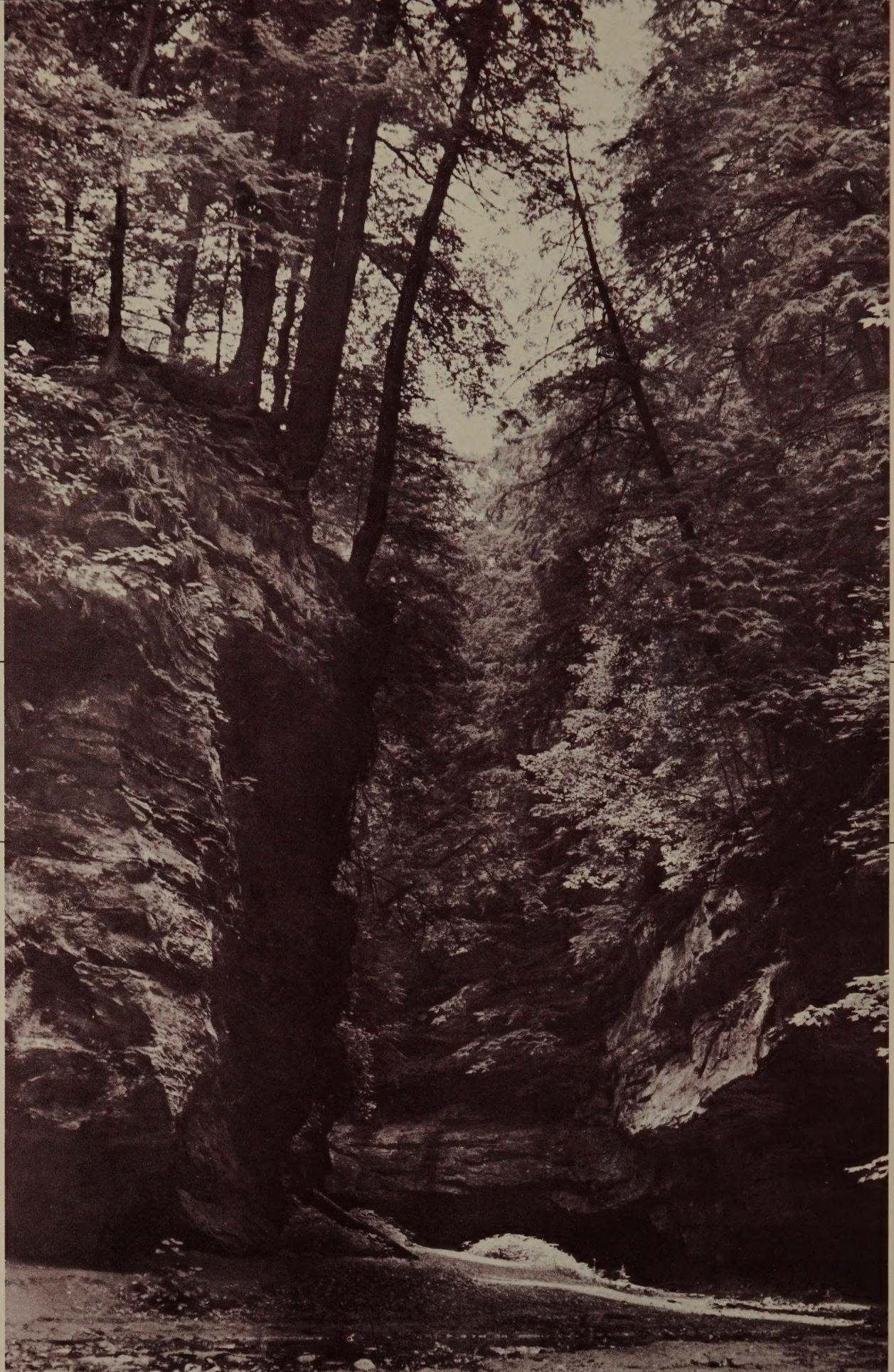

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(Left) Deep gorges and tall trees perched precariously atop sandstone bluffs greet the visitor to Turkey Run State Park.

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Natural Resources of Indiana

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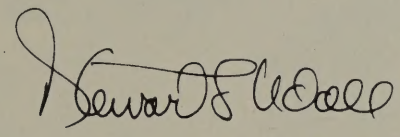
(Front cover) This covered bridge is a pleasant reminder of a time when Old Dobbin was the best means of transportation.

The purpose of this booklet is to bring a new awareness on the part of the American people of our rich natural resource heritage, its history, its present, and its future. To know our land is to love it and cherish it and protect it from the ravages both of nature and man.



Secretary of the Interior.

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(Left) Slag is separated from molten steel at a mill in Gary, Indiana ranks as one of the largest producers of steel in the U.S.

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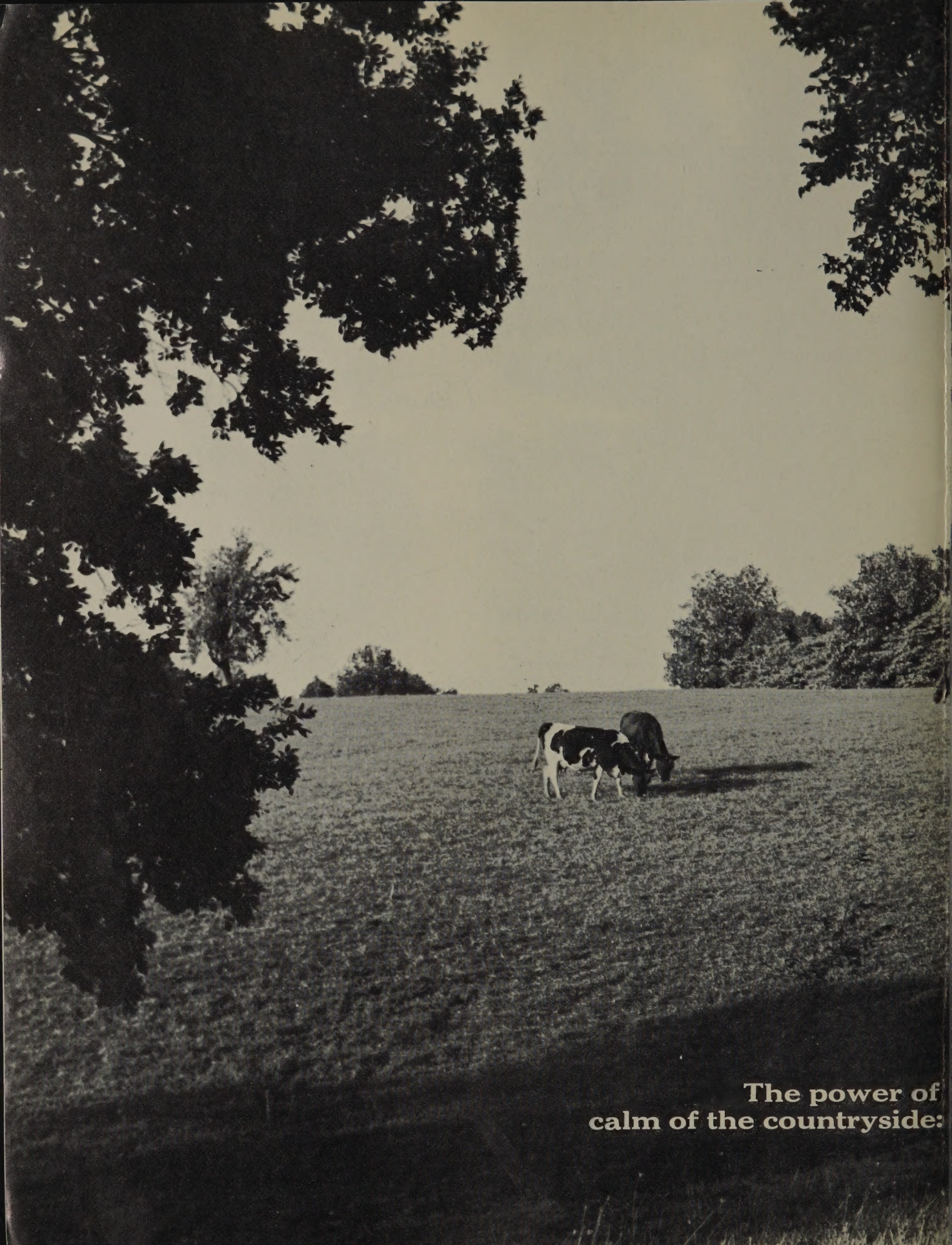
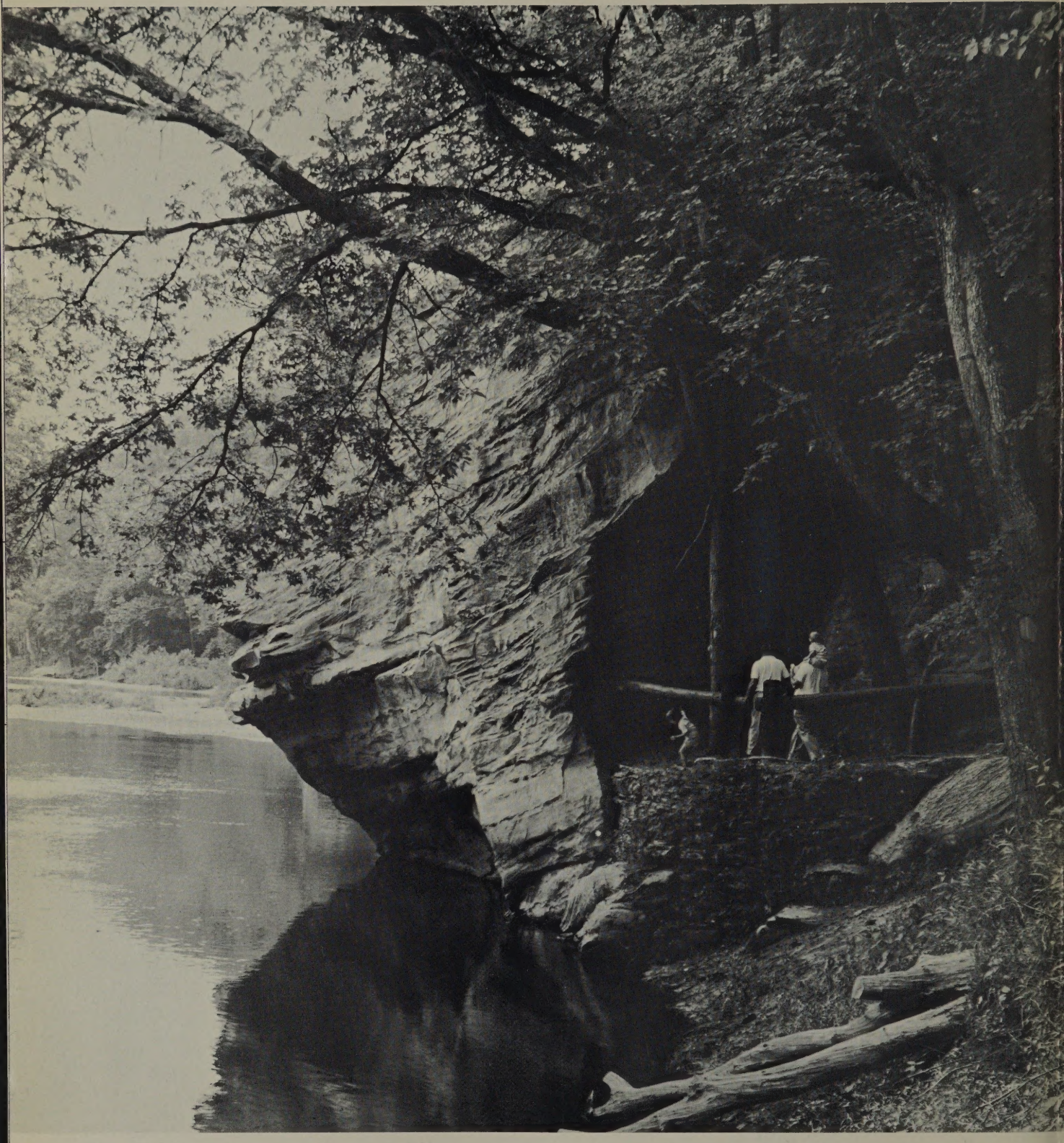

The power of
calm of the countryside:

industry; the
both belong to Indiana.

Each season brings new beauty to the countryside. Adventures await all who choose to wander through the numerous recreation areas in the State.



Introduction

What comes to mind when "Indiana" is mentioned? Giant cornfields, the northern swamps of the "Limberlost," rustic, neighborly type people who speak with their own peculiar dialect.

This is Indiana as seen through the eyes of the poet James Whitcomb Riley, and novelists like Edward Eggleston, Booth Tarkington, and Gene Stratton Porter, who wrote of the seemingly simple and unsophisticated life of the Hoosiers in bygone days. (Indiana's nickname is "Hoosier" which is reported to have several origins, the most popular being that it is a corruption of the pioneer's greeting from his cabin window to an approaching stranger—"Who's thar?".)

Indiana today is a land of sunlit streams, green fields, running brooks, trucks heaped high with a new harvest, and a hearty stock of people whose ancestors, coming from New England and the South—English, Scotch-Irish, and German—transmitted to their children their own national traditions as well as a pioneer spirit which carried them through many difficult times.

But, Indiana is also an industrial State which derives 60 percent of its annual income from manufacturing and—like most of the Nation—faces the problems that accompany a growing urban population. In this respect, and also in its wide geographical differences and its historical background, Indiana is a microcosm of the Union to which it belongs.

Early History

It is interesting that a State which was once a center of Indian nations has today one of the the smallest Indian populations in the United States. During the 17th and 18th centuries tribes came from all over the Nation to settle this unexplored land which afforded such ideal natural surroundings and climate. The Miami, Potawatomi, Delaware, and Kickapoo were the principal tribes in the region before 1763, and they lived mainly in the northern and central parts of what is present-day Indiana.

French Jesuit priests, who hoped to build missions and convert the Indians to Christianity, were the first settlers to enter the territory that is now Indiana. The fur trade also brought a large number of French adventurers into the Great Lakes region. Trader Louis Joliet and and Father Jacques Marquette reached the Mississippi River and descended it part way in 1673, but the first white man actually to explore Indiana was Robert Cavelier, Sieur de la Salle.

In the following century, the French, coming from Canada and New Orleans, and the British, expanding their influence from their colonies east of the mountains, collided in the Ohio and Mississippi valleys in a bitter rivalry.

By the Treaty of Paris in 1763, ending the French and Indian War, France ceded Canada and all the lands east of the Mississippi River to Great Britian. After this, it was evident that English law and government, as well as Protestantism, would prevail in Indiana, although many French people remained in the towns of Miami, Ouiatenon, and Vincennes.

To secure allegiance and trade of the pro-French Indians and to reduce the growing power of the original English colonies, the Crown issued the ill-famed "Proclamation Line of 1763" closing all land west of the Applachian Mountains as far down as the mouth of the Tennessee River to settlers from across the mountains.

Despite this prohibition and subsequent warnings, colonial frontiersmen continued to push westward into the present States of Kentucky, Ohio, Indiana, and Illinois. The ruling British reacted by supporting the Indians.

The American Revolutionary War

In the American Revolutionary War soon to follow, the British seized Vincennes and attempted to organize the French and Indians for

attack against the Americans. During the "bloody year" of 1777, British and Indian bands frequently raided and terrorized frontier outposts and settlements.

In December of the same year, Governor Patrick Henry and the Virginia Assembly, desirous of maintaining Virginia's claim to the Illinois country—the term applied at that time to the territories north of the Ohio River—retaliated by supporting the daring military plan of young George Rogers Clark to invade the territory and drive the British out.

The following month, January 1778, Clark, now promoted to the rank of lieutenant colonel, set out from Williamsburg, reaching the Falls of the Ohio (Louisville, Ky.) in May. On July 2, he surprised and took Kaskaskia on the Mississippi and within a month, through skillful diplomacy and the tacit consent of the French Catholic priest, Father Pierre Gilbault, induced the French in the towns of Cahokia and Vincennes on the Wabash to transfer their allegiance from the British Empire to the new United States. Clark next won over most of the local Indian tribes.

Meanwhile, Clark in winter quarters at Kaskaskia, learned of the British capture and occupation of Vincennes and of their preparation for a spring offensive. Supported by supplies furnished by Francis Vigo, a prosperous merchant among the Illinois French, Clark embarked on an 18-day, 180-mile march, surprised the British garrison, and captured Vincennes on February 23, 1779.

The American victory at Vincennes spelled the eventual defeat of British power in the Illinois country, or "Old" Northwest. Under the terms of the 1783 Treaty of Paris ending the War, all the lands north of the Ohio and west of the Appalachians—the present States of Ohio, Indiana, Illinois, Michigan, Wisconsin, and part of Minnesota—became part of the United States.

Territorial Days

Virginia, Massachusetts, and Connecticut magnanimously relinquished to the Federal Government their claims to these lands and in 1787 they were formally established as the Northwest Territory to be governed in accordance with the Northwest Ordinance promulgated the same year.

In 1800, the Indiana Territory, comprising all the present States of Indiana, Illinois, Michigan, Wisconsin, and part of Minnesota, was established, with Vincennes as capital, which it remained until 1813.

Most of the territory which was soon to become the State of Indiana belonged to the Indians, and they fought bitterly to hold the land which meant survival for their people. Defeats such as the Indians suffered at the hands of "Mad Anthony" Wayne at Greenville, only strengthened their resistance. In 1811 the medicine man Tenskwatawa, known to white men as the "Shawnee Prophet," was attacked in his village at the mouth of the Tippecanoe River and totally defeated by General W. H. Harrison. This battle and the American victory in the War of 1812 meant the end of Indian occupation of most of the Indiana Territory.

Indiana Enters the Union

In 1816 the Lincoln family moved to Indiana from Kentucky. And, in the same year, Indiana became the 19th State to enter the Union. These were formative years for both. While young Lincoln received his education and grew to manhood, the State began to develop.

Wilderness trails connected the early settlements in Indiana. Soon after statehood, the Whetzel Trace, which cut through 60 miles of wilderness, was opened from Laurel to the White River near the present town of Waverly. The National Road from Richmond to Terre Haute and the Michigan Road from Madison to Michigan City were constructed, and stagecoach travel began to flourish.

Most of the people in Indiana before 1825 lived in the southern part of the State. By 1840 numerous steamboats plied the rivers, and the Wabash and Erie Canal, started in 1832, began an era of canal travel which lasted until railroads became dominant in the last half of the century.

Population grew rapidly, and by 1850 there were approximately one million Hoosiers. By 1860 Indiana ranked sixth in population among

The George Rogers Clark Memorial, a reconstructed pioneer village, and the locks of the Wabash and Erie Canal—all these are monuments to the past.

the 33 States. A Swiss settlement was established at Vevay and German Harmonists, or Rappites, founded "Harmonie," which later, as "New Harmony," became the scene of one of the most significant social experiments in American history and for a hundred years dominated the cultural life of southwestern Indiana.

Indiana Today

The image of Indiana as a basically rural community is only a part of the total picture of the Hoosier State today. Indiana now ranks as one of the largest producers of steel in the United States. The cities of the Calumet—Gary, Hammond, East Chicago, and Whiting—comprise one of the world's greatest industrial centers.

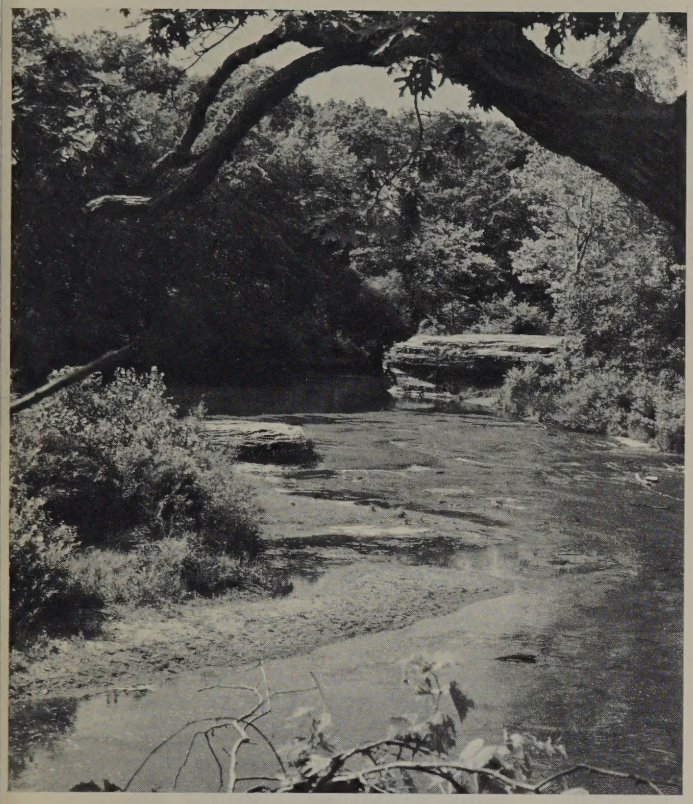
The center of the dimension limestone industry is located in Monroe and Lawrence Counties where a great deal of the building limestone used in the United States is produced.

Indiana is first in the Nation in the production of drugs, musical instruments, phonograph records, and prefabricated homes and buildings. It is a leading State in printing and in the manufacture of aircraft equipment, automotive parts, electrical machinery, brick, and tile.

This marked trend toward industrialization has not robbed Indiana of much of its rural heritage, however. Agriculture is still basic to the State's economy and to its social and political life as well. About one-eighth of the 4.6 million Hoosiers live on 153,500 farms, and these farms produce more than a billion dollars worth of products a year.

Progressive education in Indiana has its roots in the State's constitution of 1816, which called for a graduated system of free schools equally open to all from the primary level to the universities. Approximately 92,000 students are enrolled in Indiana's institutions of higher learning. Over 50 percent attend the four State universities: Indiana, Purdue, Indiana State, and Ball State.

Ask any Hoosier what his State means to him, and he will call it a state of mind—a feeling of Indiana—an entity. Hoosiers are immensely proud of their land from the rich farmland of Carroll County to the deep woods of Perry County, to the Indianapolis Motor Speedway, to the factories at Anderson and Muncie, to the banks of the Wabash and Ohio. Indiana's appeal, in other words, lies in its own inherent character and in its historical and natural resources.



Indiana lies in the eastern part of the great plains that stretch between the Appalachian and Rocky Mountains.

Physical Characteristics

Rocky canyons, virgin forests, sand dunes, rolling countryside, attractive cities and towns—all are to be seen within the more than 36,000 square miles of Hoosier territory. Often called the most typically "American" of the 50 States, Indiana lies in the eastern part of the great plains that stretch between the Appalachian Highlands further east and the Rocky Mountains in the west. Roughly rectangular in shape, Indiana has an average width of approximately 160 miles between Ohio on the east and Illinois on the west. It averages about 265 miles between its northern boundary with Michigan and its southern boundary with Kentucky along the northern bank of the winding Ohio River. Lake Michigan borders the State's northwest corner. Indiana is the 38th State in size.

Topography

Indiana is divisible into three regions with distinct and characteristic landscapes: The northern lake country, the central plains, and the southern hills and contrasting lowlands. Altitudes range from 320 feet at the mouth of the Wabash River to 1,257 feet in northeastern Wayne County near the Ohio line.

Peculiar to northern Indiana are the sand dunes and beaches along Lake Michigan. The famous sand dunes that rise along the shore of Lake Michigan to heights of more than 190 feet are the most scenic features of this part of Indiana.

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A plugged sinkhole serves as a stock pond near Corydon.

Hills of the Crawford Upland are seen near Whitehall.

In some places the dunes are being constantly shifted by the wind; in others, they are stabilized by vegetation.

The northern lake country is a region of broad plains lying north of the Wabash Valley. Almost unmodified by stream erosion, the plains were formerly extensive marshes that were drained. To the northeast are low hills and innumerable clear blue lakes, such as Lake Wawasee, the largest natural lake in Indiana. It covers 3,060 acres.

The central part of Indiana, south of the Wabash Valley, is a flat to gently undulating plain on which there are scattered long low ridges and isolated hills or groups of hills. In the western part of this plain, tributaries of the Wabash River have in places dissected the landscape into rugged hills and steep-walled bedrock gorges. Typical of such local scenic areas is the Pine Hills Natural Area along Sugar Creek in Turkey Run State Park.

Southern Indiana, noted for beautiful scenery, is a region of deep valleys and hilly uplands. The great limestone belt from Bloomington south to the Ohio River is characterized by numerous caves, sinkholes, disappearing streams, and mineral springs. Counties adjacent to the Ohio River are particularly rugged and scenic with bluffs and hilly escarpments. The picturesque Ohio River Valley widens out and becomes much less rugged in the southwestern part of the State, called "The Pocket."

Water areas within Indiana's borders include over 3,000 linear miles of rivers and small lakes and 230 miles of other impoundments ranging upwards in size to major flood control reservoirs.

Climate

Indiana has an invigorating climate of warm summers and cool winters because of its location in the middle latitudes in the interior of a large continent. Major temperature changes are caused by differences in latitude, elevation, terrain, soils, and lakes.

The effect of Lake Michigan on the northern part of Indiana is quite pronounced, particularly near the shore. Precipitation is greater in fall and winter than in most other parts of the State and average daily temperatures are warmer in fall and cooler in spring than farther south. Severe local snowstorms occur inland from Lake Michigan.

Average annual rainfall ranges from 36 inches in northern Indiana to 43 inches in southern Indiana. The average is about 40 inches a year. Annual precipitation is adequate, but an uneven distribution within a year occasionally limits crops and ground water supplies.

Mean temperatures in January range from 34.7 degrees in Evansville to 24.6 degrees in South Bend and in July from 78.2 degrees to 73.4 degrees at the same stations.

Geology

Long before life on earth, the site of Indiana was occupied by granitelike crystalline rocks,

Waves lap against the beach bordering Lake Michigan.

Men drill dynamite shot holes in this limestone quarry.

now buried beneath thousands of feet of younger stratified rock. These older rocks are known only through a few deep wells that have penetrated to them.

The thick succession of stratified rock overlying the granitelike bedrock is composed largely of sandstones, shales, and limestones deposited during the Paleozoic Era, from 600 million to 200 million years ago.

In these more recent formations, originally deposited in the shallow seaways that spread back and forth over the site of Indiana in constantly shifting patterns, there are fossil vestiges of the earliest well-represented forms of life. The abundance of shells in the oldest strata indicates that life was confined at first to the sea and consisted of invertebrate animals. Younger beds, deposited on the older beds, indicate, through their fossil content, the slow, progressive evolution of life with the development of vertebrate animals such as fish and amphibians, the first animals to live on the land.

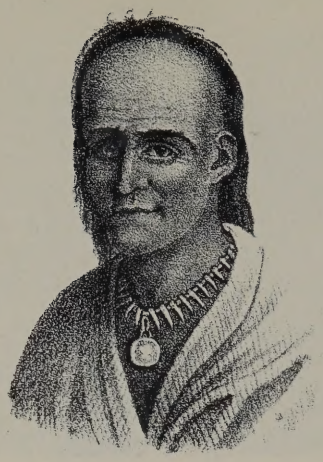
Fossil evidence shows that toward the close of the Paleozoic Era spore-bearing or fernlike plants appeared. Plant remains, accumulating in shallow waters and swamps as thick layers of carbonaceous material, were slowly transformed to beds of coal. The coal-bearing formations are the youngest consolidated rock strata that "crop out" on the surface in Indiana.

During and after the period of marine deposition, eastern Indiana was slowly elevated along a broad elongate zone producing a broad flexure that extends across the State from southeast to northwest. The sedimentary rocks which had been deposited in essentially horizontal layers were tilted. This great structure, called the Cincinnati Arch, separates two broad basinlike structures—the Michigan Basin to the northeast, and the Eastern Interior Basin to the southwest. Despite the regional significance of these great structures, they are so broad and the inclination of the layered rock strata is so slight that the unaided eye is not able to detect their dip.

About a million or more years ago, a worldwide climatic refrigeration produced conditions that generated great ice sheets far to the north. These ice sheets slowly moved as glaciers to the south and into Indiana, waxing and waning in response to warmer or cooler conditions.

The first glaciers that moved into Indiana covered almost all of the State but the south-central part, leaving deposits of clay, sand, gravel, and boulders that filled the preglacial valleys and covered the landscape with a mantle of poorly sorted rock debris known as till. Later glaciers were less extensive but likewise mantled the landscape with till, and left surficial mounds and long ridges of debris still present in central and northern parts of the State. Because preexisting valleys and streams were buried by the glacial deposits, drainage was destroyed. As a result, lakes and swamps developed in the undrained depressions after the glaciers had melted away. About 15,000 years ago the glaciers disappeared from Indiana setting the foundation for present-day conditions.

Indian Heritage



Both Little Turtle (left) and Tecumseh (right) played important parts in Indiana's history.

The State whose name most suggests "Indian" today has only one Indian community deriving from a historic group—about 100 Miamis, living in and around Peru, Ind. In addition, at least several hundred other persons throughout the State claim Indian ancestry. Most are descendants of the Miami Tribe which once moved across the lands now known as Wisconsin, Illinois, and Indiana.

Early Indians of the Indiana Region

Mound Builders, an ancient and mysterious people, flourished in prehistoric times throughout much of what is now Indiana. Evidences of their burial mounds, fortifications, and earthwork structures may still be seen in almost a third of the State's counties. They are generally conceded to be the ancestors and forerunners of many historic and modern tribes.

Archeologists' spades have uncovered evidences of this vanished race of farmers, traders, and artists whose highest development seems to have been between 400 B.C. and 400. A.D. They grew squash, corn, gourds, and beans, as well as tobacco, which they smoked in elaborately carved pipes. Beautiful pots, blades, and ornaments have been dug up from burial mounds, which covered the dead along with their possessions.

Mounds State Park, near Anderson, contains the State's largest single earthwork, in a perfect state of preservation. Evidences of 10 others are nearby.

The Miamis

When Europeans first became aware of the Miamis in the mid-17th century, they resided in the area of Green Bay, Wis. Moving south and east, sometimes driven by other northern tribes, they settled the southern end of Lake Michigan and by 1711 had reached the Wabash River. After 1763, they occupied the area now known as Indiana.

The first white explorer to the region, Robert Cavelier, Sieur de la Salle, held a council with the Miamis under a huge tree near South Bend, a site later known as Council Oak.

In the history of the Hoosier State, the Miami were prominent as a tribe that steadily resisted the westward movement of the 18th century European settlers, playing an important role in Indian wars of the area until 1795. The name of their most famous Chief, Little Turtle, appears frequently in early reports.

Little Turtle (Michikinikwa) was born at the Miami village on the Eel River in Indiana about 1752, son of a Miami chief and a Mohican mother. Although a frequent opponent of white encroachments in the 1780's and early 1790's, Little Turtle made peace with General "Mad Anthony" Wayne. He joined in signing the 1795 Treaty of Greenville, ceding most of what is now Ohio to the whites.

By the end of the War of 1812, these once warlike people began to dispose of their territory, in anticipation of receiving new lands west of the Mississippi River promised to them by the United States.

By 1840 only one Indian tract remained, reserved for a part of the tribe called Meshingomesia's Band which decided to remain on a reservation in Wabash County. Later, in 1872, the land of Meshingomesia's Band was divided among the survivors.

As a footnote to history, it should be noted that two former Miami villages are thriving communities—now called Chicago and Kokomo.

The Shawnees

Although the Miamis are best known to the region, Indiana was a refuge area for many Indian tribes during the early period of white penetration in the 18th and 19th centuries. At least a dozen groups, almost all of the Algonquian linguistic family, spent some time there. The mark of the strong Shawnees is permanently embossed in Indiana tradition.

A group of Shawnees settled in Indiana in 1798 by invitation of Delaware Indians of the White River area. Here a Shawnee medicine man, Tenskwatawa, had the vision that caused him to begin preaching among central woodlands tribes for a return to their Indian traditions, a rejection of all things white, and support of the leadership of his brother, Tecumseh.

No Indian is more inseparably linked to the history of Indiana than the Shawnee warrior-statesman, Tecumseh. A born orator, completely fearless but humane, Tecumseh's chief target was the 1795 Treaty of Greenville, which he continually attacked on the basis that Indians had owned their lands in common, and no tribe could lease any part of it without the consent of all. He urged a vast Indian confederacy, enlisting many tribes to support his idea of an Indian State.

In 1808, Tecumseh and Tenskwatawa established "Prophet's Town," at the junction of the Wabash and Tippecanoe Rivers, a rendezvous for discontented Indians of several tribes. In November of 1811, while Tecumseh was on a mission to enlist southern tribes to his cause, Tenskwatawa, defying Tecumseh's explicit orders, attacked white soldiers under General William Henry Harrison. The Indians were badly defeated, the Indian alliance degenerated, and an Indiana place name entered the pages of American history in the Battle of Tippecanoe.

Other Indian Groups

—The Illinois, Chippewas, Wyandots, and Ottawas appeared as parties to treaties relinquishing Indiana lands to white men in the 18th and early 19th centuries.

—Mohicans of the Upper Hudson River Valley established a village on the banks of the Kankakee River in 1721.

—Iroquoian groups, particularly the "Senecas of the Sandusky," drove out earlier Indian occupants but did not themselves establish permanent settlement in Indiana.

—Delawares stopped in the area between the Ohio and White Rivers, and built some six villages before moving west.

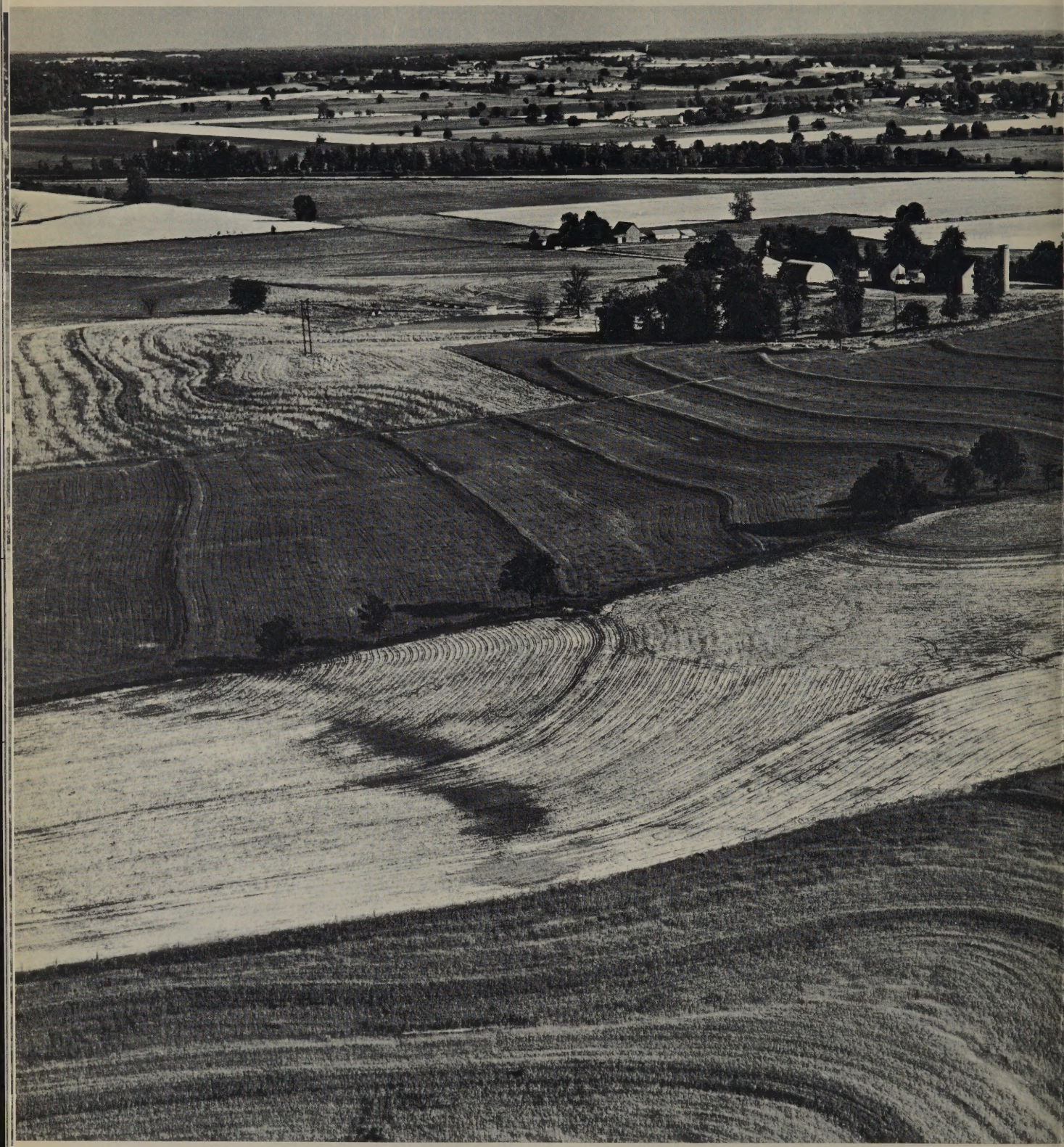
—Potawatomis were last to enter the State, establishing villages in the northern part around the end of the 18th century; but Eries, Kickapoos, and Mosopelea also passed through, lingering awhile in the Indiana region.

By 1815, the issue of whether whites or Indians should possess Indiana had been decided. Many tribes had sold their holdings or exchanged them for lands west of the Mississippi, and the few who stayed suffered from the white man's diseases and alcohol. Continuous white pressure brought about a series of treaties in which Indians gave up all claims to Indiana lands.

Of the State's once-thriving Indian life, little remains except place names such as Kokomo, Miami, Mishawaka, Wawasee, Kankakee, Maumee and the river of song and story beloved by Hoosiers everywhere—the Wabash.

The Miami Indians in recent years filed several claims with the Indian Claims Commission for payment for lands ceded under treaties with the United States. The Commission, a special tribunal established in 1946 to consider claims of Indian groups against the United States, has granted four awards to the Miamis. They are: Awards of $733,131 and $4,647,467 to the Miami Tribe as constituted at the time of the treaty of cession; a $349,193 award to the Miami Indians of Oklahoma; and a $64,738 award to the Miami Indians of Indiana. Funds have been appropriated by Congress for all except the $733,131 award.

There are no reservations, no State supervising agencies, or Federal programs operated by the Bureau of Indian Affairs in Indiana.



Land and Forests

In the early 19th century, pioneers moving westward found the Hoosier State almost completely forest covered. One of the finest stands of hardwoods in America blanketed Indiana when the first settlements appeared along the banks of the Wabash and Ohio. The "Great Forest," as Richard Gordon Lillard called it in his writings, covered more than 80 percent of the State.

Trees, like Indians, were an obstacle to progress and the man with a broadax was, therefore, a pioneer of progress. A growing America needed wood for housing, fuel, and shipbuilding—and settlers needed fertile land. Profusion of the original hardwood stands and persistence of sprouting second growth encouraged the myth of superabundance—that forests were inexhaustible and provident husbandry was unnecessary.

Although standing timber on good land stood in the way of agriculture and clearing the land for cropping was strenuous, burdensome work, few settlers would buy land unless it was wooded. The twin motives of profit and "progress" were evident in the letters of the day. Jacob Schramm, who settled in Indiana in 1836, wrote, "If the prairie is too big, however, and has no woods near it, it is not habitable, and is not purchased even if the soil is the finest."

Following the settlers, the landskinners marched westward with their sawmills into Indiana, left their marks, and moved on—convinced that "there is enough wood to last a thousand years."

Nature's Price

Before the turn of this century Indiana was a leading producer of high-quality hardwood lumber. At that time sawmills were cutting more than a billion board feet annually. As the quality stands were exhausted and more land was cleared for farming, timber production declined sharply.

Today less than 18 percent of Indiana is for-

Terracing of land decreases the danger of soil erosion.

ested. However, those forests are growing more timber than is being removed and are producing some of the finest hardwood timber in the United States. Each year there is a net annual growth of about 495 million board feet. A harvest of about 268 million board feet, almost all hardwoods, is used in Indiana's forest products industries. The balance of about 226 million board feet is added to the growing stock of standing timber. Present growth, even though all of it is not in high-quality trees or trees of more desirable species, is a good indication of the potential of the State's forest soils.

Wood is important in Indiana manufacturing and more than 10 percent of the State's industries use wood in their products. Many more use wood for crating and shipping. Indiana is one of the leading manufacturers of furniture, noted for its veneer mills. But today the annual production of high-quality hardwood logs is not enough to supply the demand of its wood-using industries. Only a part of the oak, walnut, gum, and other specialty woods now comes from local forests.

Forest Resources Today

Indiana's forest land is especially well suited for multiple use, including timber production, watershed protection, food and shelter for wildlife, and outdoor recreation. Watershed protection and water storage are high priority uses of forest land.

Except for 58,000 acres classified as noncommercial forest, chiefly in parks and recreation areas, all other forest land is available for growing and harvesting commercial timber. About 93 percent of the commercial forest is privately owned with the average holdings in 30-acre tracts. More than 100,000 farmers own nearly 2.9 million acres or about 71 percent. From their woodlots farmers get lumber, fence posts, fuelwood, and other products valued at $7 million annually. Other private owners such as coal companies, sawmill operators, estates and others own nearly 22 percent of the woodlands. Government units hold the remaining 7 percent.

Of the present forest land, 71 percent is located in southern Indiana, 16 percent in the northern section, and 13 percent in the more intensively cultivated central section. The commercial importance of the northern forest tracts is less than those of the southern part, but these northern woodlands still contain some of the finest remaining hardwood timber. Because of the flat tillable land of the northern region and the deep, fertile soils, both conducive to agriculture, the forest area is not likely to be greatly increased.

Of the 134 trees found in the State, the most common are the oak, hickory, elm, green ash, cottonwood, sycamore, soft maple, white oak, hard maple, and beech. Oak and hickory are the predominant species. Nevertheless, "soft" hardwoods constitute about 35 percent of the total sawtimber stands. Ninety-nine percent of the growing stock is in hardwoods. Sawtimber trees cover 51 percent of the forested area and poletimber covers about one-third. The remainder is in seedlings and saplings or nonstocked. Standing sawtimber totals nearly 12 billion board feet.

Statistics

Total land area of State (acres)	23, 171, 000
Original forest area (acres)	19, 840, 000
Present forest area (acres)	4, 140, 000
Original forest area (percent)	85. 6
Present forest area (percent)	17. 9
Noncommercial forest lands (acres)	58, 000
Commercial forest lands (acres)	4, 082, 000
Volume of sawtimber in commercial forests (billion board feet)	11
Commercial forest ownership:	
Private	3, 799, 000
Farm woodlots	2, 878, 000
Other private forest lands	921, 000
State, county, and municipal	111, 000
Federal	172, 000
National forest lands	112, 000
Other Federal forested lands	60, 000

Agriculture

Indiana is one of the three most intensively farmed States in the Union. Approximately 82 percent of the land, or 20 million acres valued

Forests are growing more timber than is being removed and are producing some of the finest hardwood in the U.S.

at about $275 an acre, is devoted to farming.

In general, the central part of Indiana has the most productive land with topography best suited to mechanization. Here the growing season lasts 188 days. Southern Indiana has rougher topography and older, more eroded soils. Farms in the northern part of the State average more highly productive than those in the south. The number of farms in Indiana has declined in recent years, following a national trend, but the average farm size has increased in the 1960's to more than 145 acres.

The most valuable cash crop is corn, second only to hogs as an income producer. About 5,425,000 acres are planted in this crop. The second most valuable crop is soybeans. Indiana normally ranks first or second in the Nation in the production of both corn and soybeans.

Indiana also produces fall wheat, oats, tobacco, hay, apples, red clover seed, rye, peaches, and lespedeza, a vegetable which grows well in southern Indiana. Tomatoes, strawberries, and melons are grown commercially in the south where the growing season is long. Indiana is second in tomato processing. The State is the chief producer of spearmint and peppermint raised in the rich muck soil in the northern lake region. Other important muck crops are potatoes, cabbages, onions, celery, and carrots.

About three-fifths of Indiana's cash farm income comes from the sale of livestock and livestock products, including hogs, cattle and calves, dairy products, eggs, and poultry. The total value of all livestock and poultry is $495 million. Because livestock production is so important, pastureland is in great demand. Today the major livestock- and feed-producing areas are primarily in the central section where the best farmlands are located.

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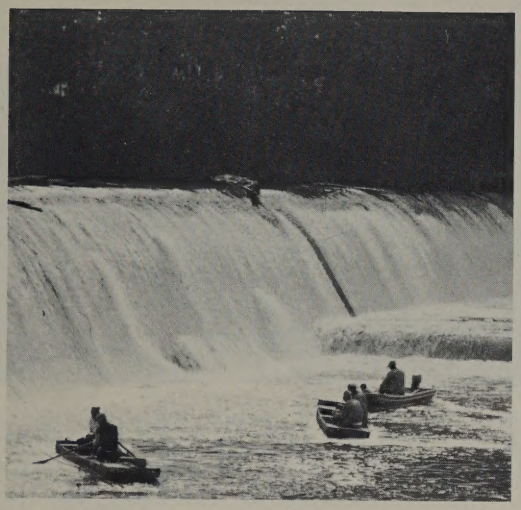
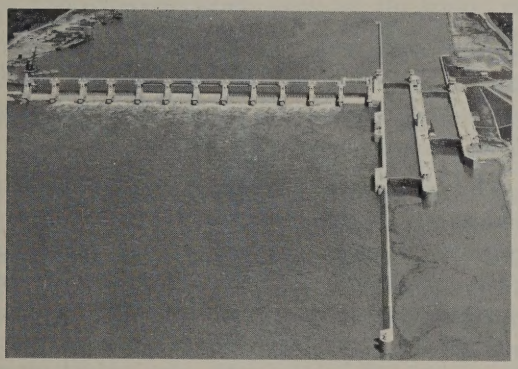


(Above) Williams Dam created a popular fishing area.
(Left) Water is abundant, however quality varies.



(Above) New dams and locks have replaced old ones.
(Below) Lakes can provide water for vegetable crops.

Water and Power

Overall, Indiana has an abundance of water, but its quantity and quality vary according to season and locality. On the average, over 22 billion gallons a day flow out of the State through its stream system. Hundreds of lakes in the northeast corner furnish recreation not only for Hoosiers but also for residents of metropolitan areas in Ohio, Michigan, and Illinois. Lake Michigan is a vast source of supply for the industrial complex in the northwest. The Ohio River on Indiana's southern border—although mostly in Kentucky by legal boundary—provides cooling water for huge steam electric plants and a waterway for barges carrying Indiana products and supplies to cities such as Evansville.

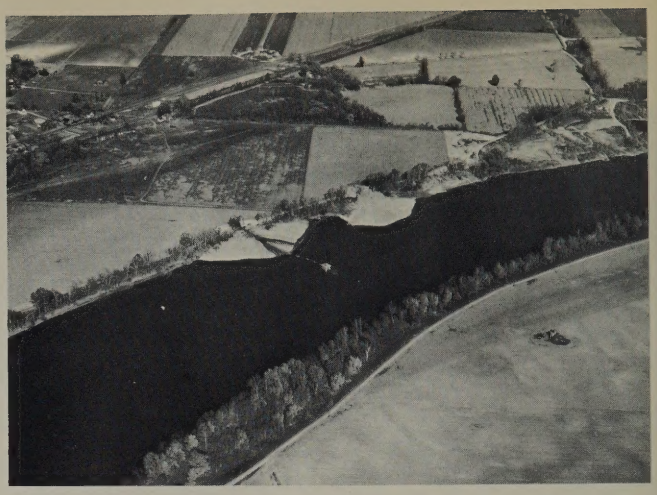
Precipitation varies from 44 inches a year in the south-central section to 34 inches in the northeast. The average is about 40 inches a year. Annual runoff—the water that drains from the land into rivers and streams—ranges from a low of about 9 inches in the northeast to 18 inches in the south-central part. Average runoff a year is about 13 inches.

The total amount of water withdrawn by industry through industry-owned facilities is about 8.6 billion gallons a day, including 6.1 billion gallons used by steam electric utilities. Withdrawal of water for municipal use is about 0.5 billion gallons a day, including about 0.24 billion gallons for industrial and commercial uses. Water usage in rural areas for domestic purposes and livestock is about 0.14 billion gallons a day.

Drainage Basins

Streams that eventually reach the Gulf of Mexico through the Mississippi River drain 97 percent of Indiana. Streams draining the remaining 3 percent discharge into the Atlantic Ocean through the Great Lakes and St. Lawrence River.

The major watershed system is the Wabash River Basin, which drains nearly two-thirds of the State. The Wabash rises in Ohio, enters



the State in Jay County, flows generally west almost to the western boundary, then turns southwest to join the Ohio River near Shawneetown, Ill. For about the lower third of its length, it forms a boundary between Indiana and Illinois.

The principal tributary of the Wabash is the White River, which drains the central part of the State, contributing an average of 7.5 billion gallons a day to the Wabash. Three flood control reservoirs, operated by the U.S. Corps of Engineers, are in the White River Basin: Cagles Mill (capacity 228,000 acre-feet) on Mill Creek, Mansfield (116,600 acre-feet) on Raccoon Creek, and Monroe (441,000 acre-feet) on Salt Creek, a tributary of East Fork White River. One hundred and sixty thousand acre-feet of the Monroe Reservoir storage is allocated for water supply and to supplement low flows downstream. Several other reservoirs in the basin provide water for larger cities.

The Kankakee River and its major tributary, the Iroquois River, drain much of the rich corn belt in northwest Indiana. They and their tributaries are dredged for most of their lengths to provide better drainage for the flat terrain. The Kankakee system carries an average of 1.3 billion gallons a day out of the State into the Mississippi River through the Illinois River.

Drainage into Lake Erie from Indiana includes the Maumee River, which is formed by the confluence of the St. Joseph and St. Mary's Rivers in Fort Wayne. Contributing to Lake Michigan is the St. Joseph River, with the Elkhart River and Pigeon Creek being principal tributaries in Indiana. A very small part of the northwest corner drains into Lake Michigan through the Little Calumet-Burns Ditch complex. Principal tributaries are Deep River, Salt Creek, and Hart Ditch.

Ground Water

Ground water, trapped below the surface in water-bearing zones called "aquifers," is important to both the public and industry. It is the principal source of supply for homes and farms throughout most of Indiana.

The ground-water resources of the northern two-thirds of the State are substantial. The principal aquifers are the sand and gravel deposits of the glacial drift. These deposits are relatively thick and extensive, with a large storage capacity. Their water is usually hard but is of good quality otherwise. Hard water is commonly considered to be undesirable for many uses, but for some purposes, such as drinking and cooking, water with a moderate amount of hardness is preferred. Well depths vary with drift thickness, which is about 125 feet on the average. Wells yield moderate to large supplies of water. These aquifers are considered the best and most important sources of ground water in the State. Their maximum potential has not been fully developed.

The southern third of the State is partially covered by glacial drift, but aquifers in these deposits are inferior, yields generally small, and the water quality only fair. The best sources of water are in the valley fill of alluvium and glacial outwash deposits of the major streams that contain thicker and more extensive sand and gravel beds. Wells in these relatively

(Far left) The Ohio River serves as a waterway for pleasure boats and for barges carrying supplies and products.

(Left) The major watershed system is the Wabash River Basin. It also serves as a source of sand and gravel.

(Right) Oily wastes and discoloration from pickle liquor are indications of water pollution in Indiana Harbor.

shallow aquifers along the Ohio, Wabash, White, and Whitewater Rivers generally yield moderate to large quantities of hard but good-quality water.

The ground-water sources of the southern third of the State have wide variability in aquifer characteristics, such as thickness, extent, depth, water-storage and yield capabilities, and water quality.

Water Pollution

Waters in the heavily industrialized portion of northern Indiana lying in the Lake Michigan Basin are too polluted to permit any recreational activity. Effluents discharged to the Little Calumet River and Indiana Harbor Canal in this area contain wastes from steel mills, petroleum refineries, chemical, paper, and food processing industries, and from several cities.

Other areas polluted primarily by municipal and industrial waste are the Maumee River Basin in the vicinity of Fort Wayne, and localized areas within the Wabash River Basin (which also contains more than 300 miles of streams polluted from acid mine drainage). Oilfield operations in the Patoka River Basin west of Jasper pollute streams in that region with brine pumped from underground as part of oil-production operations.

Inadequately treated municipal wastes have polluted the St. Joseph and St. Mary's Rivers. According to the Indiana Stream Pollution Control Board, there is also serious need for an organized program to remove raw or partially treated sewage from northern Indiana lakes.

In other areas, natural streamflows are insufficient to adequately dilute waste water effluents discharged into them. The White River below Indianapolis, the Big Blue and Patoka Rivers, are examples of Indiana streams with natural flows that need to be augmented to provide for adequate quality control through waste dilution.

Electric Power

The electric power requirement within a State depends upon several factors including population, the degree of urbanization, and the amount of industry. Most electric power in Indiana is produced at powerplants using coal as a fuel. Only a small part is produced by hydroelectric plants or by fuel plants using gas or oil.

Indiana's total power development consists of a steam-plant capacity of 8,105,778 kilowatts, a hydroelectric plant capacity of 29,155 kilowatts, and an internal combustion engine capacity of 26,363 kilowatts.

In a recent year, a total of 42.9 billion kilowatt-hours of electric power was generated in Indiana with fuel burning plants producing 97.75 percent of all electric power used.

The possibilities of producing electric power by hydroelectric turbines on rivers are limited in the Hoosier State. The largest hydroelectric powerplant is the northern Indiana Public Service Co.'s 11,000 kilowatt Oakdale Plant on the Tippecanoe River. The second largest is the Indiana and Michigan Electric Co.'s 7,260 kilowatt Twin Branch Plant on the St. Joseph River. There is about 396,000 kilowatts of undeveloped hydroelectric capacity mostly on the Ohio, Wabash, and White Rivers.

Mineral Resources

Massive limestone formations that girdle the State, tremendous fuel reserves in the southwest and countless local deposits of sand and gravel, sandstone, and clays are among Indiana's outstanding natural resources and the solid foundation of its mineral economy.

Huge blocks and columns that give character to monuments and public buildings, and thin sections of stone used to veneer other types of construction, have made "Indiana limestone" the State's best known mineral export. Bituminous coal is its most valuable single mineral product.

Annual production of the major Indiana minerals—coal, cement, all kinds of stone, petroleum, sand and gravel, gypsum, and clays—is usually valued above $200 million, better than 1 percent of the national total. This ranks Indiana somewhere between 20th and 25th among the States in a typical year.

A dozen leading coal-, cement-, and limestone-producing counties account for over half the value of all Indiana's annual mineral production. Of the State's 92 counties, all but 3—Brown, Ohio, and Union—regularly produce minerals of some kind in commercial quantities.

Mineral Fuels

In 1763, outcrops of coal were first discovered in western Indiana on the banks of the Wabash near the mouth of the Vermillion River. Commercial coal operations began on the Ohio River in 1837 at Cannelton, in Perry County, and since then a billion and a quarter tons have been mined in the Hoosier state. Of a total reserve originally estimated at 37 billion tons, at least 17 billion tons are considered recoverable by present mining methods.

Most of the more than 15 million tons now produced each year is used to generate electricity and is mined by open-pit or "stripping" methods close to where it is used. Much of the coal

A large percentage of the building limestone used in the U.S. is produced in Monroe and Lawrence Counties.

shipped outside the State comes from more than 20 underground mines that use modern machinery and have established enviable safety records.

Sullivan County, on the Wabash, is the leading county for underground coal mining and Warrick County, north and east of Evansville on the Ohio River, has the largest strip-mine production.

Indiana claims the earliest known strip-mine reclamation program in the United States, pointing to peach and pear orchards (the latter still producing) planted on reclaimed acreage in 1918. Thousands of acres have been restored and made into public recreation sites.

Much petroleum and natural gas has also been found in underground formations in or near Indiana's bituminous coal regions, and hundreds of new wells are drilled each year in coal-producing counties. Much of the present oil production of 11 to 12 million barrels annually comes from older fields. The underground pressures that once helped drive the oil to the surface have become depleted, and these fields now must be worked by secondary methods. "Proved" reserves of petroleum are sufficient to maintain production at the present rate for several years even if no further discoveries are made.

Great bubbles of natural gas discovered more than 80 years ago made Clinton in Vermillion County an early industrial center, but both production and reserves have since dwindled. Many old gasfields and individual wells, however, are still finding use as storage reservoirs for imported natural gas from the Gulf, Southwestern, and Western States. Additional reserves of fuel, as yet unmeasured are trapped in bituminous shales and sandstones lying over and under the coal and petroleum formations. Many contain appreciable percentages of kerogen, a substance that can be converted to oil under heat and pressure.

Peat, formerly used as fuel, now is dug from bogs or pits in several counties and is being marketed increasingly for agricultural purposes. Production of this mineral, still rising, totaled 60 thousand tons and was valued at over half a million dollars in a recent year. Coke is made in large quantities at the giant steel mills on Lake Michigans' shoreline, but almost entirely from metallurgical coal imported from other States.

Metal Industries

Ten million tons of pig iron and 15 million tons or more of steel are produced in a typical year in huge mills bordering Lake Michigan at East Chicago, Hammond, and Gary. A gigantic new plant at Burns Harbor in Porter County is partly in operation. Early local iron works in Indiana used native iron ore and limestone flux; later, the availability of higher quality ore and metallurgic limestone from other areas led to the success and expansion of the present industrial complex.

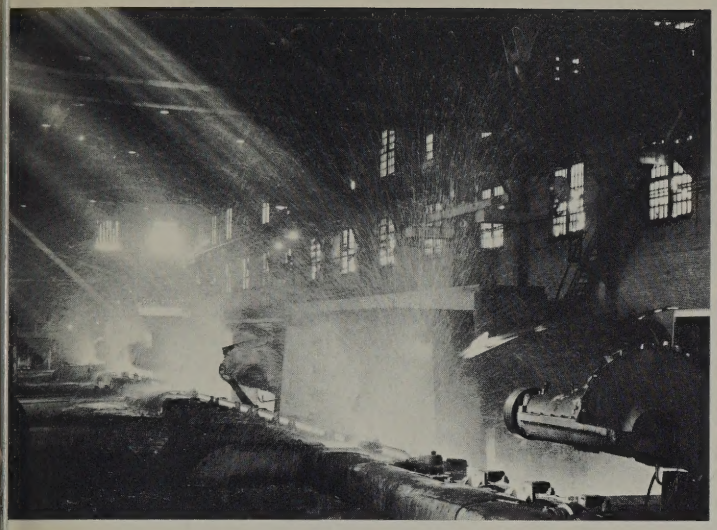
Aluminum is smelted from out-of-State alumina in Warrick County and rolled nearby in a recently erected mill. Aluminum and steel fabricating plants are located in a number of Indiana's industrial cities.

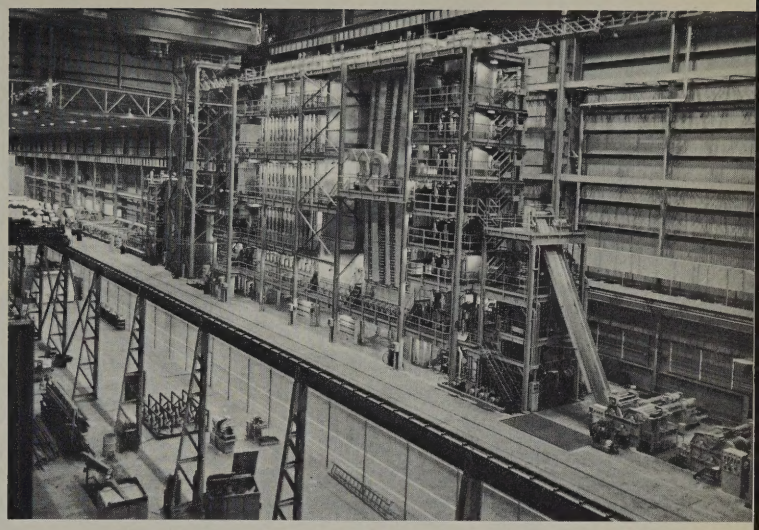
Construction Materials

Indiana's beautiful and easily worked limestone is an almost inexhaustible resource. When cut to precise dimensions, it is used in massive buildings, but nearly 30 times as much by weight—about 20 million tons annually—is crushed or broken for making concrete, in agriculture, as roadstone and ballast, and many other uses. In a typical year stone quarries in 56 counties have a combined output valued at upwards of $30 million, of which 99 percent is accounted for by limestone. Sandstone and calcareous marl account for the remainder.

Cement follows coal as the second most valuable mineral product. Cement is made, using Indiana limestone, coal, and clay, at plants in Lake, Lawrence, Putnam, Clark, and Cass Counties. Total yearly production is from 12 to 14 million barrels, about two-fifths of which is used in Indiana. Most of the remainder is used in neighboring States but some is shipped down the Ohio and Mississippi or through the Great Lakes. The abundance of raw materials and increasing demand for cement throughout Indiana and adjacent States indicate a bright future for Indiana cement.

Gypsum is mined in Martin County in the southwest and processed to make plaster, wallboard, and other building materials. Another

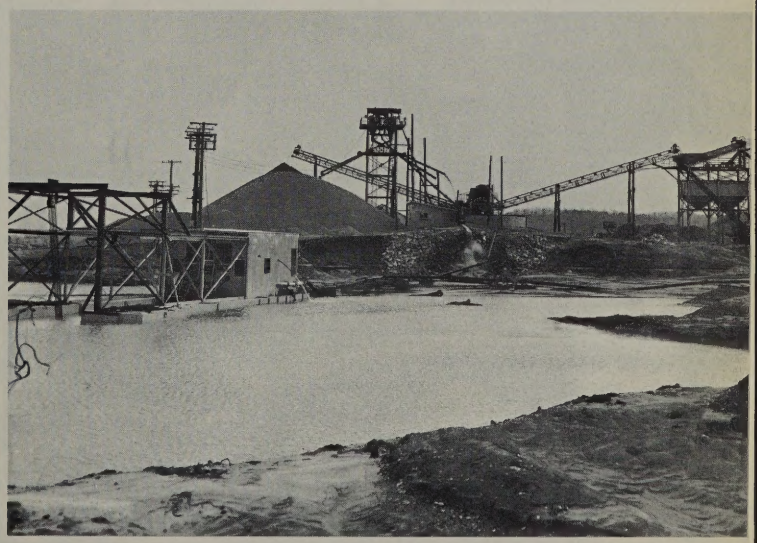


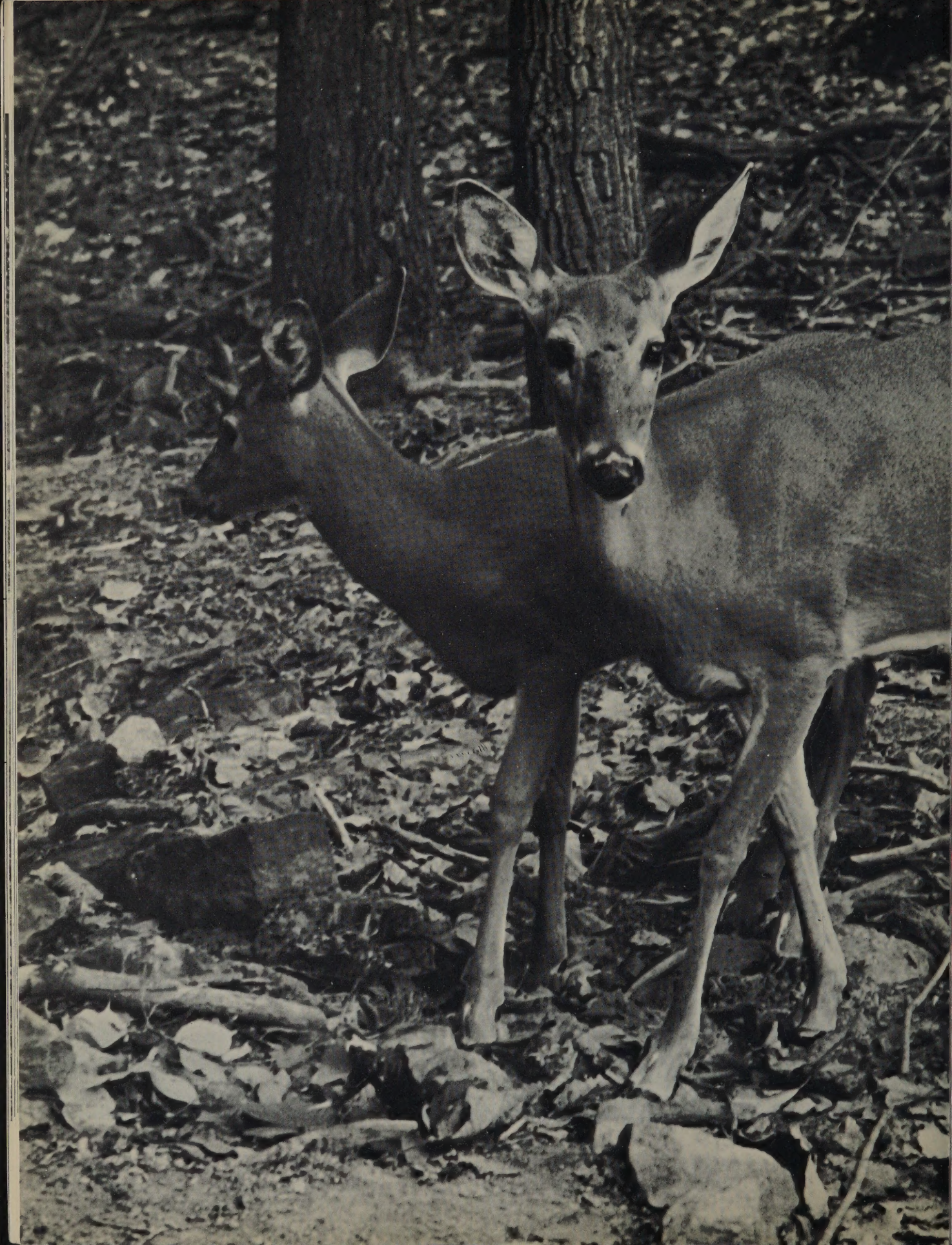


Fifteen million tons or more of steel are produced in a typical year in mills at East Chicago, Hammond, and Gary.

massive deposit of gypsum—not yet worked—is near La Porte, in La Porte County. Fireclays are mined in seven counties, primarily to be used in Indiana for making floor and wall tile, terra cotta, refractories, and pottery. Other clays are mined in 18 counties for use in making cement, lightweight aggregate for concrete products, and various types of pottery and heavy clay items for which fireclay is unsuitable. Sand and gravel, available in all counties, is produced annually in 80 or more counties at the rate of 20 million tons or more a year and is valued at nearly a dollar a ton. Blast-furnace slag from steel plants in Lake County has been crushed for use as an aggregate and processed—sometimes with other minerals—to make lightweight aggregate, mineral wool for insulation, roofing granules, and cement. Imported perlite has been expanded at plants in Lake, Martin, and Scott Counties to make lightweight aggregate and for use in building plaster and as insulation.

(Left) Coal is sometimes recovered by strip mining methods. (Right) A dredge is used to remove sand and gravel.





Fish and Wildlife

Where fish and wildlife resources are concerned, the changes wrought on the face of Indiana by settlement and development have been profound and irreversible.

Indiana, except for limited areas along the western edge where the "tall grass" prairie extended into the State, was originally covered with some of the best hardwood timber in the country. When white men first visited the State, wild game, including elk, black bear, white-tailed deer, timber wolves, gray squirrels, wild turkey, and ruffed grouse, was abundant. Buffalo ranged the adjoining grasslands in great herds and extended across the Falls of the Ohio into the bluegrass country of Kentucky.

Land was the most important resource contributing to the 19th century settlement of Indiana. As Indiana progressed toward becoming one of the three most intensively farmed States in the Union, the herds of big game disappeared and many of the smaller game species which depended on vanishing woodlands also began to disappear. Industrial development and urban sprawl speeded these changes.

Pollution of streams and rivers in the highly industrialized and urbanized sections have seriously affected fishery resources. Impoundments, varying in size from farm ponds to large flood-control projects, have added new fishing waters, but they have also created new problems in fishery management. Less affected by development have been approximately 1,000 natural lakes in Indiana, most of which are now encircled by cottages. Some alterations have occurred, however, in water levels and shorelines of these lakes.

Small Game

The best cottontail hunting in Indiana is in the lowlands and flats of the southeast, with good hunting in the west-central and southwest parts. Below-average cottontail areas include the northwest, Kankakee sand region, east-central, southeast, and south-central. The

northeast lakes region is rated about average. Indiana hunters annually take about 1,700,000 rabbits.

The best grey squirrel hunting in Indiana is in the south-central hills region, where this species makes up 40 percent of hunters' bags. Squirrel hunting is also rated above average in the southeast lowlands and flats, good in the southeast hills, and fair to good in the river bottoms of southwest Indiana. The central and northern sections of the State are generally poor for squirrel hunters because of a combination of weather and poor food conditions. Indiana hunters kill about 1,300,000 squirrels a year.

White-tail Deer

Once abundant in Indiana, the white-tail deer all but disappeared when settlement brought extensive land clearing and year-round hunting. To re-establish the deer herd, the State Department of Natural Resources embarked on a re-introduction program in the hilly and wooded counties of the south-central section. The white-tailed herd, estimated at 30,000, is now statewide in distribution. Approximately 5,000 deer were shot in a recent year by paid license holders and by landowners hunting on their own property.

Furbearers

Muskrat harvest ranges from best in the northeast lakes region and good in the Kankakee sand region to low in the southwest and poor elsewhere. Opossum are taken most frequently in the southwest and less often in the north. Night hunting for raccoon, a popular Indiana sport, ranges from good in the southwest to fair to good in the northeast lakes region. Fox hunting reaches its peak of popularity in the southeast lowlands and flats.

Game Birds

The southwestern section of the State offers the best quail hunting, but the southeast lowlands also furnish excellent hunting. Rated fair to good are the west-central and south-central sections of the State while to the north the heavier snowfall and lack of cover limit quail populations. Indiana's quail harvest totals about 750,000 a year.

The prairie areas of western Indiana produce the best pheasant hunting. Pheasant are also well established in the northeast lakes region and in the Kankakee sand region. Indiana's take of ring-necked pheasants averages about 135,000 birds a year. A State-operated game farm produces about 20,000 pheasants a year for stocking State-owned public hunting areas.

The best Hungarian partridge hunting is in east-central Indiana, though scattered flocks are found in the northeast lakes region and in some of the burr oak openings of the extreme northwest part, where they occupy habitat formerly used by the prairie chicken, or pinnated grouse. About 5,000 Hungarian partridge are bagged in the State each fall.

Ruffed grouse, once abundant in the northwest, are now gone from that region and remnant flocks are found only in the south-central hills region. The prairie chicken has also disappeared from its former range in the northwest and only remnant flocks remain in the Kankakee sand region. Indiana produces substantial numbers of mourning doves but does not permit hunting of this species.

Waterfowl

Although drainage has spoiled the Grand Marsh of the Kankakee sand region as a prime waterfowl hunting area, the region still provides some waterfowl shooting. Fair to good gunning still exists in the southwest section of the State, though waterfowl numbers there depend on weather conditions.

Fall concentrations of waterfowl occur along Lake Michigan and to a lesser degree in the northeast lakes region, where coot shooting is popular.

About 45,000 ducks and coots, 5,000 geese, and 6,000 woodcock are killed annually in Indiana.

Wildlife administrators now recognize that thousands of persons will spend millions of dollars annually for transportation, camping, and equipment, visiting areas where wildlife may be

Duck hunting in flooded timberland is popular sport.

When settlers first came, wild turkeys were abundant.

seen, photographed, and generally appreciated. Birdwatchers from several States visit the Jasper Pulaske State Park to see the greater sandhill cranes during their spring and fall migration.

Fishery Resources

Natural lakes in the north are popular for bluegill, crappie, and largemouth bass, and some have northern pike, walleye, and white bass. A few lakes are managed specifically for rainbow trout.

Artificial lakes are concentrated in the central and southern sections of the State—primarily flood-control reservoirs, city water reservoirs, and lakes on State lands. These furnish largemouth bass, bluegill, crappie, channel catfish, and bullheads.

Major fishing streams in Indiana include the Kankakee, Tippecanoe, Wabash, White, East Fork of White, West Fork of White, Whitewater, Muscatatuck, Salamonie, Mississinewa, Flatrock, and the Blue Rivers in Harrison and Washington Counties. Popular species are smallmouth and spotted bass, rock bass, channel catfish, carp, suckers, sauger, freshwater drum, and walleye. A small number of trout streams, maintained by stocking, are popular.

It is estimated that 665,000 anglers fish in Indiana each year and that they average about 26 fish each for a total catch of approximately 17 million fish.

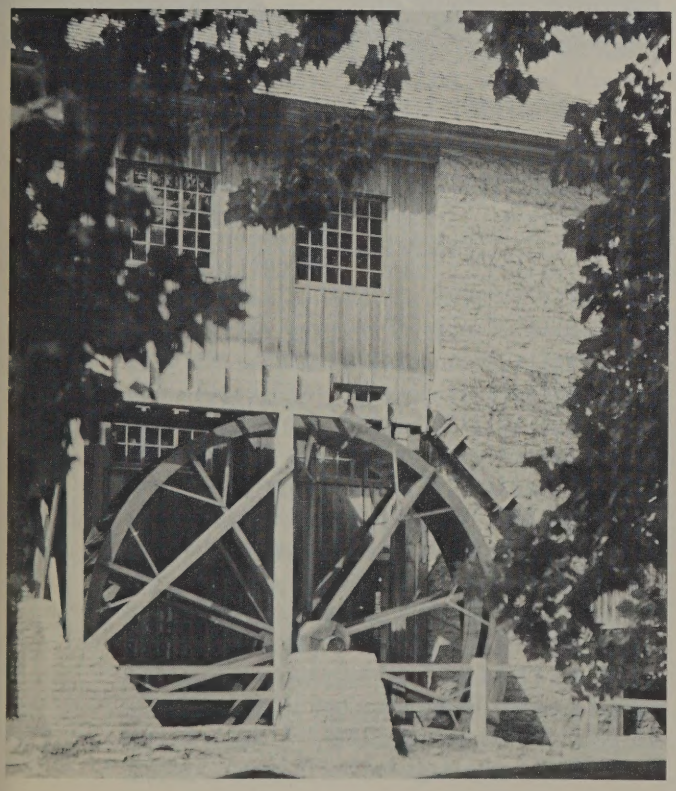
Commercial Fishing

Commercial fishing operations in Indiana are carried out on the Wabash and Ohio Rivers and Indiana waters of Lake Michigan. During 1964, 2 million pounds of fish and mussel shells were taken in Indiana waters according to the Bureau of Commercial Fisheries. The harvest of mussel shells from the Wabash River accounted for over 95 percent of the volume and value of commercial fisheries products. Buffalo fish, catfish, and bullheads were the dominate species of fish in the catch. Other species taken in small amounts included carp, paddlefish, sheepshead, sturgeon, and suckers.

Licenses Support Resources

Nearly 700,000 Hoosiers annually buy resident hunting licenses and almost 750,000 purchase resident fishing licenses. Indiana also permits its residents to purchase combination hunting and fishing licenses. More than 30,000 nonresidents fish in Indiana during an average year, and about 3,000 nonresident hunters come to the State. License sales to deer hunters exceed 26,000. Bow hunting for deer is also popular. More than 6,600 archery deer licenses are sold annually.

The Bureau of the Census estimates that Indiana outdoorsmen contributed a substantial part of the approximately $4 billion a year spent on hunting and fishing in the United States. Using census figures from the second national survey on the economic values of hunting and fishing, the Indiana Department of Natural Resources determined that Hoosier nimrods spend about $30 million a year to hunt, while Hoosier anglers spend almost $60 million a year.



Boating, fishing, and swimming in lakes; hikes in Indiana Dunes State Park; visits to a reconstructed pioneer village at Spring Mill State Park: these are some of the varied recreational opportunities which are available.

Outdoor Recreation

To the visitor, Indiana offers surprising scenic contrasts and outdoor recreational opportunities. Within its borders are more than 1,000 cool, blue, glacier-born lakes, wide prairies and pastureland, narrow valleys, rock-faced cliffs, and snow-white beaches. A marked change of seasons heightens the beauty of Indiana's natural landscape.

There are deep gorges, natural bridges, and waterfalls in the State, even though the land is comparatively level. Among its best known formations are Marengo Cave in Crawford County and the Wyandotte Caves, among the largest in the Middle West, in the Lincoln Hills area of southern Indiana.

Indiana also enjoys a wealth of significant historic sites, replete with reminders of its prehistoric Indian culture, its former French and British occupancy, its struggles to procure the land for American settlement, and its subsequent political, social, and economic development as part of the Northwest and Indiana Territories and as a State.

The Indiana Department of Conservation released a 10-year master plan for an acquisition and development program designed to meet the State's conservation and recreation needs through 1975. The study estimated an increase in Indiana's population from 4,662,498 in the 1960 census to 6,200,000 by 1975. Estimates were that the State would spend some $57 million over the next 10 years for recreation and conservation. In 1964, some 231,000 acres of Indiana lands were used for State parks,

State forests, and fish and game areas. It is expected that recreation land acquisition, an important element of the 10-year program, will add approximately 129,000 additional acres to assure increased opportunity for recreation and other allied uses.

In 1965, the Indiana State Legislature established a Department of Natural Resources to administer conservation and outdoor recreation programs and act on behalf of the State in Federal-State programs.

Outstanding areas within the State include several Federal historical sites, a national lakeshore, and State parks and State forests.

Indiana Dunes National Lakeshore

Located adjacent to Gary, and only 35 miles from Chicago on the south shore of Lake Michigan, the newly authorized *Indiana Dunes National Lakeshore* presents a unique opportunity to improve the environment of millions of crowded city dwellers. Fine beaches and magnificent dunes with their "singing sands" cover more than 1,000 acres creating an area of rare beauty. Behind the shore lie marshes and densely forested land where great white pines, sassafras, and tulip trees grow and the juniper and blueberry bushes and flowering cactus bloom. The inner marshes and ponds furnish an outdoor laboratory for either casual observation of plant and bird life or scientific study.

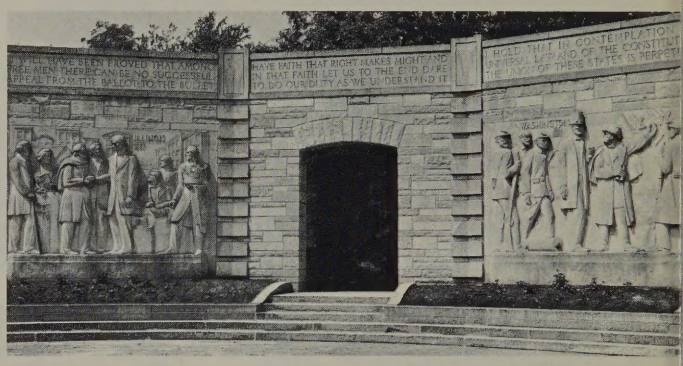
Hiking, picnicking, camping, horseback riding, photography, fishing, boating, skiing, and tobogganing can all be enjoyed here.

Referring to the national lakeshore, President Johnson said, "Its beaches and woodlands will provide a haven for the birdlover, the beachcomber, the botanist, the hiker, the camper, and the swimmer . . . Within a 100-mile radius of the Indiana Dunes there are 9½ million people crowded into one of the greatest industrial areas of our country. For these people, as well as for millions of other visitors, the *Indiana Dunes National Lakeshore* will offer ideal recreational opportunities. Here man can find solace and relief from the pressures of the industrial world."

Lincoln Memorial

The Lincoln Boyhood National Memorial, near Lincoln City, commemorates the site where Abraham Lincoln grew from boyhood to manhood, developing the character that was to serve the Nation so well in later decades. *The Lincoln Boyhood National Memorial* includes the Nancy Hanks Lincoln Memorial, consisting of the gravesite of Lincoln's mother, the site of the cabin where the family lived, and the Memorial Building, totaling 114 acres donated to the Federal Government by the State of Indiana.

In 1816 when Abe Lincoln was seven, his father, Thomas Lincoln, moved his family from Kentucky, across the Ohio River, settling on Pigeon Creek in what is now Spencer County. Here the family lived for 14 years on the spot



For 14 years Abraham Lincoln lived in Spencer County.

now commemorated by the Memorial. Here Nancy Hanks Lincoln died and was buried.

The National Memorial is 4 miles south of Dale on State Highway 162.

Interstate Parklands

A *Lincoln Heritate Trail* was proposed as a result of a joint agreement among the Governors of Kentucky, Indiana, and Illinois. The trail loops across the three States, following the movements of the Lincoln family, connecting the places and events that molded the life of the 16th President. Plaques bearing the profile of the youthful Abe Lincoln mark most of the trail.

From the *Abraham Lincoln Birthplace*, a National Historic Site at Hodgenville, Ky., the trail leads to the Knob Creek Farm, Lincoln's second home. From there it follows as closely as possible the route taken by the Lincolns when the family migrated to Indiana, crossing

the Ohio River from Louisville, Ky., to the vicinity of Evansville, Ind. From this point, the trail crosses the southwestern corner of Indiana, connecting the *Lincoln Boyhood National Memorial*, Lincoln City, the *Lincoln Pioneer Village* at Rockport, and the *Howard National Steamboat Museum* at Jeffersonville.

Also located along the trail in Indiana are the *George Rogers Clark National Historical Park*, the Registered National Historic Landmarks, *Angel Mounds* and *New Harmony*, as well as a number of other points of interest.

George Rogers Clark Memorial

The George Rogers Clark Memorial at Vincennes is circular in form, nearly 90 feet in diameter and 82 feet high. The bronze statue of Clark, heroic in size, by the sculptor Hermon A. MacNeil, is enclosed by 16 Doric columns and 7 large mural oil paintings on canvas by Ezra Winter, depicting important scenes in the history of the Northwest Territory. On the grounds surrounding the Memorial are two noteworthy statues: one of Francis Vigo, carved in granite and facing the Wabash River and a bronze figure of Father Gibault near the Old Cathedral of St. Francis Xavier.

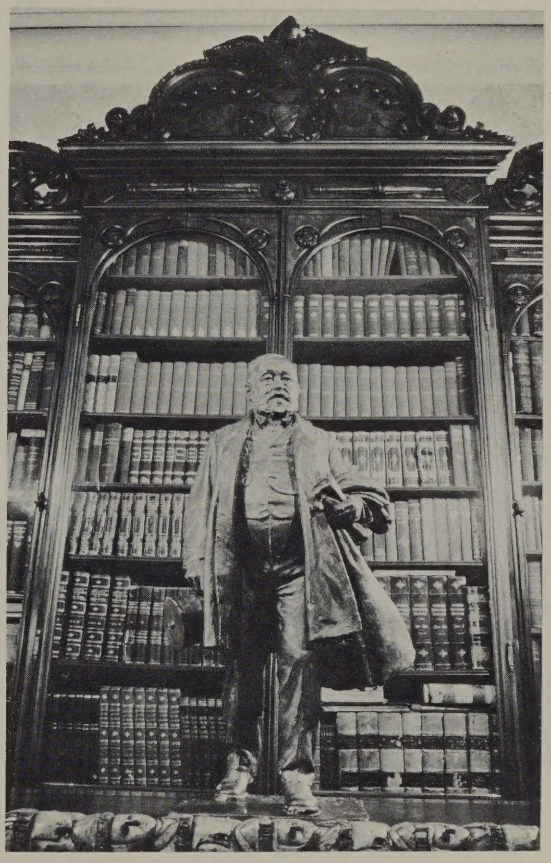
The Memorial building is part of the newly authorized *George Rogers Clark National Historical Park*, the first park in the national system to commemorate the Northwest Territory. The park is a dedication to the courage and tenacity and devotion to liberty that brought a band of 175 frontier fighters through hardship on a march of more than 200 miles toward Vincennes. Wet and hungry, they arrived on an island within full view of the garrison at Fort Sackville. They attacked immediately and victory brought an end to British power in this region. Four years later the Northwest Territory became part of the United States, and the way to the west was open.

The two-room frame building which served as the capital of the Indiana Territory from 1800 to 1813; Grouseland, the William Henry Harrison mansion erected about 1803, and the St. Francis Xavier Church, built in 1824–34, have been proposed as inclusions in the National Historical Park which now comprises about 17 acres. The additions would further portray the broad story of the town of Vincennes' role in the conquest and development of the old Northwest.

Registered Landmarks

Eight Registered National Historic Landmark sites have been designated by the National Park Service as possessing "exceptional value" in commemorating the history of the United States:

Angel Mounds, located 8 miles southeast of Evansville, is one of the largest and most impressive "Mississippian" temple mound sites, covering over 100 acres, with numerous rectangular houses, temples, a town square, and a palisade augmented with projecting bastions of 120-foot intervals. The site was occupied by prehistoric Indians from about A.D. 1400 to 1600.



Benjamin Harrison's home in Indianapolis was designated a Registered National Historic Landmark.

Benjamin Harrison Home, at 1204 North Delaware Street, Indianapolis, was built by General Benjamin Harrison in 1872, 18 years after his arrival in Indianapolis to practice

law. It remained his home, except during the years when he was U.S. Senator and 23d President of the United States, until his death in 1901.

Grouseland, or *William Henry Harrison Mansion*, at Scott and Park Streets, Vincennes, was the home of the 9th President of the United States when he was Territorial Governor of Indiana (1804–1812). The structure, built in the style of a Virginia plantation mansion, served as military headquarters and fortress during the

This maze is located at New Harmony where ventures in communal living were undertaken.

Indian attacks that led to the Battle of Tippecanoe (1811). It was on the 300-acre Grouseland Estate that the Treaty of Grouseland was signed.

The mansion itself has been recommended for inclusion in the *George Rogers Clark National Historical Park.*

James Whitcomb Riley House was the brick Victorian residence of the Hoosier poet after 1877, and contains many of its original furnishings and relics. The Riley House stands at 528 Lockerbie Street, Indianapolis.

Joseph Bailly Homestead, near Chesterton, is the 1822 home of an independent fur trader, who has been called the first white settler in northern Indiana. His home, which was situated on the trails from Fort Dearborn to Fort Wayne and to Detroit, became a meeting place for whites and Indians, an "oasis" for travelers, and a religious and cultural center-for all.

The Bailly Homestead has been selected for inclusion in the *Indiana Dunes National Lakeshore.*

Levi Coffin House, at 115 Main Street in present Fountain City, was from 1826 until 1847 one of the most active stations on the underground railroad. While he lived in this gray-brick house, Levi Coffin is reputed to have aided the flight to freedom of nearly 2,000 slaves.

New Harmony is the site of two separate 19th century experiments in communal living. The first experiment was carried on by a German pietistic group called Harmonists, or Rappites. In 1814, they bought 30,000 acres of land on the banks of the Wabash and built the town of "Harmonie."

The second was under the leadership of Robert Dale Owen, a successful British industrialist and philanthropist of New Lanark, Scotland, who purchased the entire community in 1825, and renamed it "New Harmony." This new community, founded on the utopian theory that universal happiness can be attained through universal education, drew together scientists, educators, and intellectuals from all over the Western World. The first kindergarten, trade school, free public library, and women's club were attempted here by the Owenites. New Harmony was also the scene of the first geological survey. This historic landmark is located 26 miles northwest of Evansville on U.S. 460.

Tippecanoe Battlefield, on State Highway 225, 7 miles northeast of Lafayette, is the site of the famous battle on November 7, 1811, between General William Henry Harrison and Shawnee medicine man Tenskwatawa. A victory for the whites, the battle of Tippecanoe destroyed plans for a confederation of northern and southern tribes against westward expansion. The battlefield is a memorial to Harrison's soldiers who died fighting here.

Two Registered Natural Landmark sites have

also been designated by the National Park Service as being of exceptional quality and significance in illustrating the natural history of the United States:

Cowles Bog, 10 miles west of Michigan City, is an educational and research asset where centuries-old matted moss floats on an underground lake, providing opportunities for observation and study of three distinct habitats in proximity—marsh, bog, and transition to swamp.

Pinhook Bog, a 27-acre bog located 4 miles south of Waterford, lies within a bowl-shaped depression, thought to be a glacial kettle, and is surrounded by wooded hills.

Both Cowles and Pinhook Bogs have been included in the *Indiana Dunes National Lakeshore*.

Federal Forests

Hoosier National Forest, extending southward from Bedford, its headquarters, and encompassing 722,460 acres, is administered by the U.S. Department of Agriculture's Forest Service.

Recreational facilities include 5 campgrounds, 22 picnic areas, 2 swimming sites, and 1 boating area. Nearly 350,000 people annually enjoy Hoosier's peaceful scenery while camping, picnicking, hiking, hunting, fishing, and boating.

Naturalists should not miss the Pioneer Mothers' Memorial Forest, part of the National Forest, with its outstanding specimens of black walnut. The history buff's journey will not be complete if he misses the old trail of the migrating buffalo between the western plains and the French lick. There are also scenic drives enhanced by dogwood and redbud in the spring and, in autumn, colorful foliage brings visitors from all over the State.

Sports fishing is popular in the East Fork of the White River, in Salt Creek, in the Ohio River, and in other rivers located within Hoosier. Hunting for deer, squirrel, and partridge is permitted.

State Forests

Fourteen State forests in Indiana embrace nearly 118,000 acres of woodland. Although the forests are used primarily for timber production and control of erosion on worn-out fields, good management has also restored wildlife habitats and improved the beauty of much of the land.

Clark State Forest is the oldest and one of the largest forests in Indiana, occupying 20,000 acres of timberland, narrow ravines, and fine fishing lakes. Much of the land was originally part of George Rogers Clark's grant, provided for in the Virginia Cession of Claims to the Northwest Territory after the Revolutionary War.

Clark State Forest lies just north of the metropolitan area which includes Louisville, Jeffersonville, and New Albany. It is directly accessible from U.S. 31.

Frances Slocum State Forest, consisting of 1,089 acres located on the east side of the Mississinewa River about 6 miles southeast of Peru, is one of the best examples of work being done in a State forest to develop it for recreational purposes. Facilities are being expanded to meet the urgent need for more camping, picknicking, horseback riding, and water activities areas. Across the Mississinewa River, which borders the State forest to the west, is the grave of Frances Slocum, the "White Rose of the Miamis," who was captured by Indians at the age of five, and lived the rest of her life among the Miamis, by whom she was admired and respected.

State Parks

Indiana has set aside more than 53,000 acres of public land for State parks and memorials. Scattered throughout the State, the 21 parks and recreation areas have gained a nationwide reputation for beauty and excellence. Visitors come from near and far to ride horseback through hardwood forests, swim in cool blue lakes, or simply to enjoy nature at its most beautiful. The following parks have all of these features plus particular interest of their own.

Brown County State Park, a favorite setting for artists, consists of over 15,000 acres of wooded hill and forest. Situated in the silt-

stone country of southern Indiana, the park has deep gorges and valleys cut by many creeks and streams. The lodge within the park memorializes Kin Hubbard (1868–1930), the creator of "Abe Martin," the rustic philosopher of Brown County Hills. It offers over 100 miles of bridle trails and 9 miles of hiking trails and recreation facilities for such sports as swimming and square dancing. A unique adventure is to be found in the 1,500-acre archery hunting area, where the only weapon permitted is the bow and arrow.

The park is located on State Highways 46 and 135, near Nashville, 48 miles south of Indianapolis.

Spring Mill State Park, close to Mitchell, may remind the visitor of Williamsburg, Va., in that it is a reconstruction of an early American village and includes an original water-powered grist mill, reconstructed sawmill, post office, bootshop, and lime kilns, in addition to many restored houses and other structures. The park's large virgin forest, 30-acre lake, and several natural caves make it one of the most popular recreation areas in southern Indiana.

The park is located on State Highway 60 near Mitchell.

Clifty Falls State Park, named after the famous waterfalls in the park, is located on the bluffs about 400 feet above the Ohio River. From the high plateaus an occasional paddle-wheeler may be seen traveling beside boats carrying petroleum and other Indiana products. Twelve miles of hiking and bridle trails and 6 miles of park drives give the visitor a closer view of the park's spectacular panorama.

Clifty Falls State Park is located on State Highways 256 and 7 near Madison.

State Memorials

In addition to its State parks, Indiana has 14 State memorials, including:

Limberlost State Memorial, the Geneva home of Gene Stratton Porter, the famous woman author.

Wilbur Wright State Memorial, near New Castle, the birthplace site of Wilbur Wright, who together with his brother Orville made the first power-driven airplane flight in history.

Corydon Capitol State Memorial at Corydon, the scene in 1816 of the birth of Indiana as a State and the State capital until late in 1824 when the more centrally located Indianapolis became the permanent capital. Before becoming the State capital, Corydon had from 1813 to 1816 been the Territorial capital of Indiana.

Private Enterprise

Privately owned recreation facilities are of major importance in Indiana. These vary from resident summer camps for boys and girls to fine hunting and fishing areas. The State's crop- and pasture-lands contribute significantly to the supply of outdoor recreation opportunities. Many operate as vacation farms, accepting tourists who live at the farm during their stay. Others lease or supply hunting opportunities, often in combination with cabin and camping facilities. Camping, picknicking, fishing, hiking, horseback riding, and guide services are provided by some, while others lease or sell scenic sites for home and camp lots.

Lists of all privately operated recreation opportunities in Indiana are not available from any single source. Travel bureaus and agencies, commercial organizations such as gasoline companies, motel and hotel associations, airlines and railroads, local chambers of commerce and outdoor clubs and organizations all can supply information about many of the privately owned facilities. Local inquiry will reveal others. Information is also available from the Indiana State Chamber of Commerce, 201–212 Board of Trade Building, Indianapolis, Ind. 46204.

Programs of Federal Natural Resource Agencies

The natural resource functions of the Federal agencies represented in this booklet are extensive and detailed and are only briefly described. Additional information can be obtained by contacting the offices noted in the following programs section.

U.S. Army Corps of Engineers

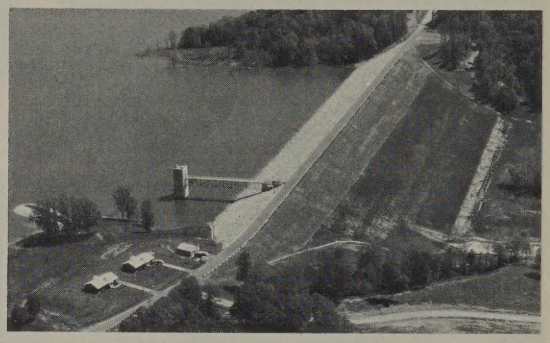
Water is a key factor in the cultural and economic growth of Indiana. The Corps of Engineers of the U.S. Department of the Army is concerned with developing and conserving the Nation's water resources. In the Hoosier State, the Corps is presently coordinating comprehensive basin studies of the Ohio and Wabash Rivers. In these basins, the Corps is involved in planning to meet the long- and short-term needs in the areas of flood control, water supply, water quality control, navigation, hydroelectric power, flood plain planning, recreation, and fish and wildlife development. Cooperating in the surveys are many Federal, State, and local agencies.

The Corps' principal mission is flood control and improvement of navigation. Projects for flood control completed by the Corps in Indiana are all located in the Ohio River Basin. They include protection projects along the Ohio River and in the Wabash River Basin. It is estimated that these local protection projects have prevented flood damages amounting to over $75 million. Completed Federal flood-control reservoirs, such as Cagles Mill and Mansfield, have prevented further large drainage besides promoting recreation and other benefits. Monroe Reservoir, the largest impoundment in Indiana, was completed in 1965. This 11,000 acre multi-purpose reservoir will provide greatly increased opportunities to participate in outdoor recreation.

In addition, four multi-purpose reservoirs—Brookville, Mississinewa, Huntington, and Salamonie—are currently under construction by the Corps in Indiana. Temporary storage during nonflood seasons will be provided in all four reservoirs so that some measure of improved low flows can be attained during the dry season.

Navigation projects include further improvement of important commercial harbors on Lake Michigan. Two harbors, Calumet and Indiana, are integral parts of the extensive Great Lakes waterway system, which is connected—via the St. Lawrence Seaway—with domestic and foreign ocean ports for oceangoing traffic. They are also important links between the Great Lakes system and the land transportation system which meet at these ports.

The Ohio River is an important component of the extensive Mississippi River system of inland waterways and annually accounts for a very substantial part of the traffic movement over that system. Since completion of the original navigation project on the Ohio River in 1929, traffic has increased from about 20 million tons to almost 89 million tons annually. Rapid development of towing equipment and techniques during this period has resulted in much longer and larger tows. A program to modernize the Ohio River waterway to suit modern traffic has been underway since 1955.



Flood control is not the only benefit of dams and reservoirs; often recreational opportunities are expanded.

The water resources survey portion of Corps' activities in Indiana keeps water resource development abreast of changing needs. Some 24 investigations are now in various stages of completion in Indiana. They range in mag-

nitude from highly complex problems of basin-wide water planning to relatively simple studies of flood protection for individual localities.

Further information on Corps projects in Indiana can be obtained from District Engineer, U.S. Army Engineer District Chicago, 219 South Dearborn Street, Chicago, Ill. 60604; and District Engineer, U.S. Army Engineer District Louisville, Post Office Box 59, Louisville, Ky. 40201.

Federal Water Pollution Control Administration

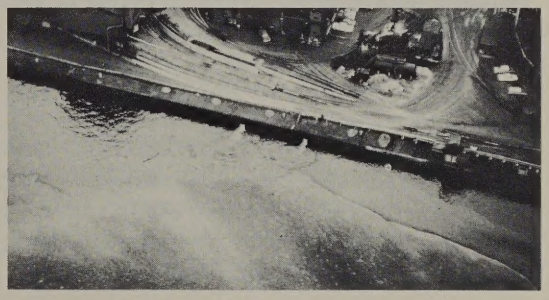
To accomplish its mission in Indiana, the Federal Water Pollution Control Administration works closely with the State Stream Pollution Control Board and coordinates with other water resource agencies at all levels.

The program seeks to protect water for public supplies, fish and wildlife, recreation, agriculture, industry, and all constructive uses. Its objectives are partially accomplished through monetary grants to the State for betterment of its water pollution control program, to communities as incentives to build local waste treatment facilities, to colleges and universities to support research and training.

Federal grants make up about one-third of Indiana's current $316,000 annual budget for State water pollution control activities. In addition, towns and cities have received Federal grant offers of $17 million to aid in the construction of 135 treatment projects costing $66.5 million to control municipal pollution. At Purdue University, three water pollution research projects and a training program in sanitary engineering are supported by annual grants of approximately $48,500.

Indiana is served by a new Midwest water laboratory and training center at Ann Arbor, Mich. This laboratory will broaden and greatly enhance Federal scientific and training services in water supply and pollution control and fit them to the region's problems.

A comprehensive water pollution control program considering present and long-range water needs is under development by the Federal Water Pollution Control Administration in cooperation with private, State and interstate, municipal, industrial, and local representatives. Two studies within this program, the Ohio River Basin and the Great Lakes-Illinois River Basin studies, include substantial areas of Indiana which lie within these basins. Evansville is a field station for the Ohio Basin study. Specific Indiana segments of the studies include the Maumee River system as part of the Lake Erie Basin plan-



(Above) Trash pollutes a river. (Below) The various shades of the river indicate that several oils pollute it.

ning and the Wabash River Basin as part of the Ohio Basin project.

In addition, determinations are made of water that must be stored by Corps of Engineers reservoir projects for streamflow regulation to control water quality. Four proposed reservoirs—Big Walnut Creek at Greencastle, Big Blue near Greenfield, Donneyville on the Flat Rock River, and Richland Creek Reservoir at Bloomfield—have been evaluated.

A special study, recently concluded at Geist Reservoir near Indianapolis, evaluated factors

that affect water quality changes in a public water supply reservoir, principally as the result of recreational activity.

The first Federal enforcement conference to involve Indiana (and which included Illinois) was held in March 1965. Initiated under the Federal Water Pollution Control Act, the conference concerned interstate pollution in the highly industrailized southern Lake Michigan area, including specifically the Grand Calumet, Little Calumet, and Calumet Rivers, Lake Michigan, Wolf Lake, and their tributaries. New solutions pioneered in this and other Federal water pollution control enforcement actions in the Great Lakes have been criteria for maximum allowable concentrations of pollutants. In the southern Lake Michigan case, data had been collected by the Lake Michigan group of the Great Lakes comprehensive project. A technical committee, composed of Federal, city, State, and industry representatives, worked intensively for a 6-month period following the conference to develop proposed criteria from this data. The criteria recommended were then unanimously adopted by the conferees in the Lake Michigan case.

Indiana is one of the first two States in the Nation whose water quality standards have been approved by the Department of the Interior under the Federal Water Pollution Control Act.

An inventory of water pollution at Federal installations has disclosed that Indiana's 261 such establishments are discharging only a minor percentage of their wastes untreated. Corrective steps are being taken.

As part of the national water pollution surveillance system, two sampling stations are maintained in Indiana: One on the Ohio River at Evansville, and one on the Wabash River at New Harmony.

Further information about the Federal water pollution control program in Indiana can be obtained from the Regional Program Director, Federal Water Pollution Control Administration, Region V, U.S. Department of the Interior, 433 West Van Buren Street, Room 712, Chicago, Ill. 60607.

Bureau of Sport Fisheries and Wildlife

The Bureau of Sport Fisheries and Wildlife conducts several programs that benefit the citizens of Indiana.

One involves studying water development plans of other Federal agencies and private industries in the State to determine effects of such projects on fish and wildlife resources, to recommend measures to prevent or reduce damages, and to improve these resources. The Bureau's River Basin Studies office in Lebanon, Ohio, supervises these activities.

The Bureau cooperates with State agencies,

The white-tail deer is found throughout the State.

industry, and agriculture to control predators, rodents, and nuisance nongame birds, by providing technical information and demonstrating control methods. The Bureau also investigates new animal control baits, repellants, and toxicants. Headquarters for this work is the Agricultural Experiment Station, Purdue University, West Lafayette, Ind. 47907.

Bait materials for animal control not available commercially have been prepared since 1934 at the Bureau's Cooperative Bait Mixing Station, Purdue University. The Station distributes baits to several States and is financed by a revolving fund operated by the University and the Bureau.

The Bureau of Sport Fisheries and Wildlife

assists in managing sport fishing on Federal lands, principally on military and military-related Federal installations. Since the late 1950's 860 acres of fishing waters have received nearly 9,000 man-days of use annually. Military and civilian personnel make the heaviest use of these fishing waters, most of which are also open under certain conditions to nonstation personnel.

Although there are no National Fish Hatcheries in Indiana, Bureau-operated hatcheries in Ohio and Kentucky produce largemouth bass, channel catfish, bluegill, and sunfish for stocking fishing water, particularly farm ponds. These fish are also used to stock lakes rehabilitated by removal of undesirable fish. A new project to be headquartered in the southern part of the State will provide additional fishery management services within Indiana and adjacent States. The activities of this project will be coordinated with those of the States to help meet the growing needs of the general public for recreational fishing.

Game management agents stationed in Indiana enforce Federal wildlife conservation laws and regulations to preserve migratory game birds. They also investigate disease and poisoning of wildlife, assist in controlling wildlife that harm crops, and sponsor information and education work with youth and adult groups.

Fish and wildlife work under the Federal Aid to Fish and Wildlife Restoration programs has made important contributions to hunting, fishing, and outdoor recreation in Indiana. Excise taxes collected by the Federal Government on firearms, shells, cartridges, fishing rods, and artificial fishing lures are apportioned back to the States for fish and wildlife work on a matching basis. To date, wildlife restoration programs in Indiana have received nearly $7 million in Federal aid funds and fish restoration programs nearly $2 million.

Additional information on the activities of the Bureau of Sport Fisheries and Wildlife in Indiana can be obtained from the Regional Director, Bureau of Sport Fisheries and Wildlife, 1006 West Lake Street, Minneapolis Minn., 55408.

U.S. Forest Service

The Forest Service, U.S. Department of Agriculture, administers the Hoosier National Forest from its Eastern Regional Office in Milwaukee, Wis. Bedford is headquarters for both Hoosier and Wayne National Forest of Ohio.

Like all National Forests, Hoosier is managed according to Forest Service multiple-use principles for sustained timber yield, watershed protection, wildlife habitat, recreation, and scenic enjoyment for most people, both now and in the years ahead.

More than 90 percent of Hoosier National Forest is commercial forest land, from which

The natural wealth of the land is evident to campers.

6,119,000 board feet of timber was cut in a recent year. Predominantly hardwood, the timber is about 45 percent red and white oaks, followed by beech, maple, elm, yellow poplar, and black walnut.

These National Forest timber stands, so vital to the local and National economy, are under constant surveillance—pruned, thinned, and treated for disease and insect pests. As trees are harvested, new trees are planted.

The forested countryside in southern Indiana is uniquely attractive, with a quality somewhat reminiscent of a Currier and Ives print.

As the Nation's population increases, use of the National Forests continues to grow to such an extent that the Forest Service must intensify management and protection activities to avoid serious overcrowding of forest facilities. Thus, the Forest Service has embarked on a "Develop-

ment Program for the National Forests" to insure availability of resources to meet demands anticipated by 1972, and to plan for the year 2000.

Under this program, plans for Forest Service land in Indiana include construction of 15 campgrounds and picnic sites and related facilities; development of a small and big game range on 4,700 acres and of 20 wildlife watering facilities; planting of 13,000 acres to trees; and construction of 87 miles of multiple-use roads.

State and Private Cooperation

As in other States, the Forest Service cooperates with Indiana State agencies in local conservation programs, such as the distribution of seedling trees for the forest farmer; management of State or privately owned forest plantations; flood protection; forest pest and disease control; and prevention and control of forest fires on State or private land.

The Forest Service maintains a 153.74-acre tree nursery at Vallonia within the Hoosier National Forest. In a recent year, nearly nine million trees were shipped from the nursery to State and private owners; and two State nurseries shipped out more than three million trees in the same period.

Under a cooperative plan, woodland owners are given technical and, in some cases, financial assistance in planting and managing private woodlands in the Hoosier State. In a typical year, timber harvest from private woodlands amounts to 3.7 million board feet, with an approximate market value of $173,400.

Research

Forest Service research projects, conducted in many locations across the country, have contributed substantially to the efficiency of National Forest management in Indiana.

In nearby Carbondale, Ill. at the North-Central States Forest and Range Experiment Station, studies on new uses for low-grade hardwoods have had a notable economic influence on forestry. From such research has evolved products like wood "brick" tile and strip paneling which have attracted considerable interest among homeowners and manufacturers.

Other North-Central States Station studies applicable to Indiana forest management, include cultivation of mixed hardwoods and market development for small woodlands.

Forest Service Offices in Indiana include: Hoosier National Forest, Stone City National Bank Building, Bedford, Ind. 47421; Brownstown Ranger District, Brownstown, Ind. 47220; Tell City Ranger District, Tell City, Ind. 47587; and Vallonia Nursery, Vallonia, Ind. 47281.

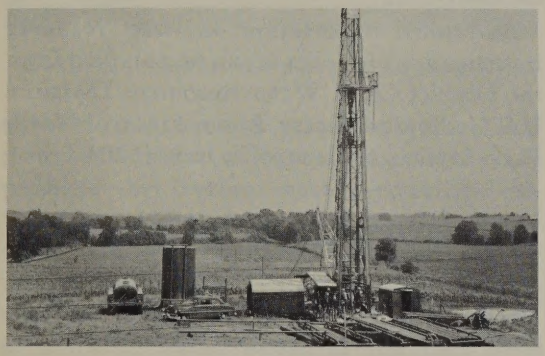
Geological Survey

Scientists of the Department of the Interior's Geological Survey are conducting several geologic and geophysical studies in Indiana which contribute to increased knowledge of mineral resources and of the earth's composition, structure, and history.

Investigations in regional and experimental geology aim to determine the materials the land is made of and how they were formed. Geologists examine rocks and soils on hills and mountain slopes, in streambeds, in quarries and road cuts, or wherever they are exposed, to find out what kinds of rocks are present, how they originated, and whether they have been deformed or altered since they were formed—their geologic history. These studies are supplemented by specialized laboratory techniques to determine the exact mineral composition and microscopic texture of the rocks, which usually reveal much more about how the rocks were formed than can be seen in the field. Paleontologists study the fossil remains of animals and plants found in many rocks and provide information on the age of these rocks and the character of the ancient plains, swamps, or oceans in which they were deposited. Mineralogists, geochemists, and geophysicists use field and laboratory studies of the chemistry and physics of minerals and rocks to obtain further information on the processes by which the earth and its rocks were formed and are being continually modified.

Geophysical studies in progress in the southeastern part of Indiana and southwest Chicago are designed to investigate patterns of natural radioactivity and their relation to geologic factors.

A basic product of the geologist's studies is a geologic map, which uses line or color patterns and various symbols to show what kinds of rocks are exposed at the surface and the probable shapes and structures of the various rock units at depth. Geologic maps are useful in determining the location, depth to, and dimensions



This drilling rig probes the earth searching for oil.

of economically valuable bodies of rock (such as ores or building stones), or areas where such bodies might be sought; the depth to potential water or oil-bearing beds beneath the surface; and the distribution of rocks that because of their properties may be either favorable or unfavorable for specific engineering uses. Regional geologic research in progress during 1964 included studies of the development of the Ohio River Valley to determine the sequences of glacial events. Results of these studies will assist in outlining important aquifers, as well as provide data on distribution of useful sand and gravel supplies.

In addition to these general geologic investigations, the Geological Survey conducts research in economic geology—the geology of mineral and mineral-fuel resources—which attempts, through geologic mapping and related studies, to outline areas in known mining districts where there may be additional mineral deposits; to locate areas outside known districts that are broadly favorable for the occurrence of concealed deposits; to find sources of elements for which new uses have created or are likely to create, important demands; and to develop new tools and methods of exploration.

Investigations in engineering geology integrate geologic mapping with studies of geologic materials and processes, to provide information on a broad range of engineering problems, such as the suitability of certain areas for urban development or the construction of dams, bridges, tunnels, or highways, or their unsuitability because of potential earthquake, subsidence, or landslide hazards.

Topographic Mapping

The Geological Survey has published 7½-minute topographic maps at 1:24,000 scale (1 inch equals 2,000 feet) for the entire State, one of nine States completely mapped at this scale. These large-scale maps are used extensively for urban planning studies and preliminary engineering investigations. Fifteen-minute topographic maps at 1:62,500 scale (1 inch equals about 1 mile), suitable for less intensive land use studies and preliminary engineering investigations, cover approximately one-seventh of the State. The entire State of Indiana is covered by maps of the 1:250,000 series. Work on a new State map at 1:500,000 scale is planned to begin in 1967.

In 1920, Indiana began its first cooperative topographic mapping program with the Geological Survey with a 1-year program. In 1938, the program was resumed. The continuous cooperative program has greatly expedited complete topographic mapping of the State. The current cooperative program with the Department of Natural Resources includes revision of some 3,500 square miles to update older maps for urban planning and development studies, flood control investigation along the Wabash River and tributaries, and other water supply and conservation projects.

Indiana is a major coal and steel producing State and ranks high in agricultural production. Topographic maps have contributed toward industrial and agricultural growth and development. Extensive use is made of large-scale topographic maps for general engineering studies for highway construction, water supply

and conservation, flood control, and recreational projects; and in the mapping, inventory, and conservation of the State's natural resoruces. Topographic maps show both natural and manmade features and are especially useful to the hunter, trapper, fisherman, and vacationer.

The mapping program is expected to continue primarily as a revision and maintenance program to keep the maps up to date. One objective of the Geological Survey will be to recognize these needs and to try to keep pace with them.

Water Resources Investigations

The Geological Survey also has the responsibility of determining the amount, quality, and location of water in Indiana both underground and in streams and lakes. The expanding trend in population and industry, with its potential increase in number and variety of water problems, emphasizes the importance of water resources investigations.

The program consists of specific investigations and continuing statewide basic data networks. It has been developed, in cooperation with State agencies and with other Federal agencies, to meet the most urgent needs for water information and, in turn, to provide an accumulation of water facts and observations that will be needed in the future to make wise decisions concerning water development and management.

Streamflow records in Indiana are being collected at 169 continuous gaging stations and, during periods of low flow, at 60 additional partial record stations; lake levels are measured at 146 lakes. Ground-water levels are measured at 145 wells to monitor fluctuations in storage. Water quality is monitored at 18 stream sites from which are collected 13 records of sedimentation and 10 records of water temperature; in addition, water quality is monitored at 1 station on the Ohio River as part of the Ohio River Valley water-data program.

The raw data from these continuing networks provide information on quantities and on variation from day to day which cannot be obtained by any other means.

Additionally, however, the studies and reports seek to increase the usefulness of the data, thereby broadening very considerably the base of Indiana's water knowledge. Some representative investigations include descriptions of the lakes of Indiana and their function in the total water-resources picture; research on heat and biological characteristics of the lakes; river profiles; and reconnaissance of sediment yields of Indiana streams; water resources of Delaware County; geology and ground-water resources of selected counties and other areas; and a definition of the salt water resources of the State.

Additional information on water resource investigations in Indiana can be obtained from the District Chief, Water Resources Division, U.S. Geological Survey, Room 516, 611 North Park Avenue, Indianapolis, Ind. 46204.

Bureau of Mines

Conservation is the ultimate objective of all activities conducted by the Department of the Interior's Bureau of Mines. In Indiana—as elsewhere throughout the Nation—this primary goal is achieved by intensive evaluation of the State's mineral resources, by research to develop improved mining and processing techniques, and by varied programs designed to promote safe and healthful working conditions in the mineral industries.

Health and Safety Activities

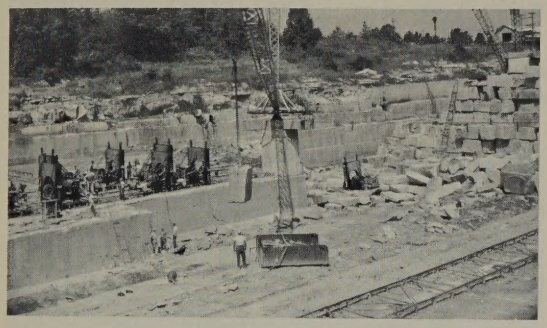
A District Health and Safety Office at Vincennes is field headquarters for this phase of Bureau activities in Indiana, Illinois, Missouri, Iowa, and western Kentucky.

This office plans and directs the work of a small but effective force that carries out the Federal Government's responsibility for safety inspections of coal mines, provides expert instruction in first aid and accident prevention for mineral industry workers, and responds immediately to emergency calls for assistance at mine rescue operations.

Minerals Research

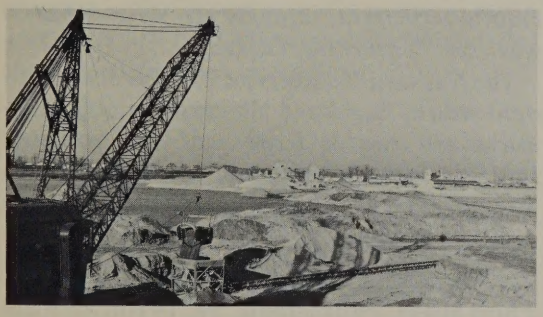
Although the Bureau maintains no minerals research installations in Indiana, studies it conducts elsewhere are yielding knowledge

that can benefit Indiana's mineral industries and help expand the State's usable resources. For example, improvement in drilling speeds and



Limestone is removed from a quarry near Bloomington.

more efficient blasting practices, which could materially reduce costs at Indiana quarries, are promised by Bureau mining research. Experiments with special additives for drilling fluids will provide information that can be used to increase the efficiency of wire saws and other methods for cutting dimension limestone. In addition, Bureau studies of vibrations from quarry blasting are establishing a better understanding of the relationship between blasting



A dragline dips gravel at a pit in Marion County.

conditions and damage to buildings. This will be particularly useful to Indiana quarry operators in determining the proper magnitude for blasts and the distance from buildings at which quarries may safely operate.

In another research field, Bureau scientists are obtaining valuable knowledge of the physical and chemical properties of oil reservoir rocks and are finding ways to improve oil production methods while increasing ultimate recovery of petroleum. Both the fundamental knowledge and the methods resulting from this work will help Indiana oilfield operators do a better job in developing this important fuel resource.

The Bureau also is conducting research to develop economical and effective methods for controlling acid mine waters which pollute streams in Indiana and elsewhere.

Mineral Resource Studies

In its continuing efforts to provide realistic evaluations of the economic potential for known mineral resources, the Bureau is currently emphasizing studies of Indiana's shale and clay deposits. These investigations employ modern engineering techniques and comprehensive knowledge of mineral economics and industrial technology to determine whether such deposits can be developed profitably under present conditions.

Samples of shales and clays are collected by the Bureau throughout the State and tested to find materials that are suitable for making lightweight aggregate, which is increasingly in demand as an ingredient of light, strong, concrete products with desirable insulating properties. A recently completed phase of this program disclosed promising deposits of shale in four counties: Warren, Morgan, Jackson, and Clark.

Also underway is a statewide study to determine potential uses, demand, and resources of fire clays in Indiana.

In all of these activities, and in the collection of statistical and economic information on mineral production and use, which it publishes regularly, the Bureau of Mines cooperates closely with Indiana's mineral industries and with State and local conservation agencies.

Further details concerning Bureau programs and activities in Indiana can be obtained by writing to the Office of the Area Director, Bureau of Mines Area III, East 58th Street at Mississippi River, Minneapolis, Minn. 55417

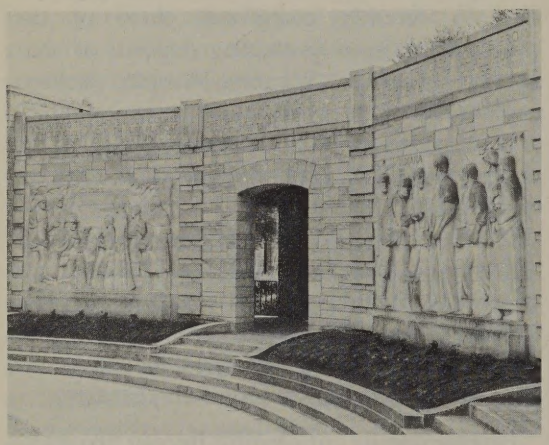
National Park Service

The Department of the Interior's National Park Service administers *Lincoln Boyhood National Me-*

morial, near Lincoln City. The Memorial, which encompasses 200 acres of the southern Indiana frontier farmsite where Abraham Lincoln grew to manhood, was added to the National Park System in 1963 and already 185,600 visitors from every State in the Union, Canada, and many other foreign countries have been recorded.

When fully developed, the Memorial will emphasize the 16th President's boyhood years from 7 to 21, and show their impact upon him as Emancipator, Preserver of the Union, Conciliator, and Humanitarian. A trail with interpretive stops at such points of interest as Nancy Hanks' grave, the cabinsite, Lincoln spring, and Lincoln trace is already in existence. Other interpretive trails and a parking area are planned.

The *Indiana Dunes National Lakeshore*, an area long recognized as one of the important remaining undeveloped shoreline areas of the Great Lakes, contains 8,271 acres. The shoreline, which extends for 13 miles, is backed by beaches, woodlands, and marshes. The area provides recreation for millions of people living in Mich-



Boyhood years in Indiana greatly influenced Lincoln.

igan City, Gary, and Chicago. The lakeshore attracts swimmers, campers, hikers, bird watchers, and botanists. In addition, its preservation protects natural features significant for their geologic and biotic history.

The *George Rogers Clark National Historical Park* is located at Vincennes, once western outpost of the Nation. The authorization for this park provides for the donation by the State of Indiana to the Federal Government of the *George Rogers Clark State Memorial* and cooperative agreements with the owners of *Indiana Territory State Memorial*, the *William Henry Harrison House*, called *Grouseland*, and the Roman Catholic *St. Francis Xavier Church*.

Millions of city dwellers can easily reach Indiana Dunes.

This National Historical Park portrays the story of Vincennes from the days when it was a French settlement through the days when it was the Territorial Capital.

The National Park Service has also designated eight sites as Registered National Historic Landmarks and two as Registered Natural Landmarks, all described in an earlier chapter.

Information on activities of the National Park Service in Indiana may be obtained from the Northeastern Regional Office, 143 South Third Street, Philadelphia, Pa. 19106, or from the National Park Service, Department of the Interior, Washington, D.C. 20240.

Bureau of Outdoor Recreation

Under the Land and Water Conservation Fund Act of 1965, the Department of the Interior's Bureau of Outdoor Recreation administers a program of financial grants to States and their political subdivisions for outdoor recreation

planning, acquisition, and development. In order to participate in the grants, each of the 50 States and the Territories of American Samoa, Guam, Puerto Rico, and the Virgin Islands prepared comprehensive outdoor recreation plans and each named a liaison officer to work with the Bureau in the program. In Indiana, the

Recreational areas must serve large urban populations.

Director of the Department of Natural Resources has been designated State liaison officer.

The Land and Water Conservation Fund Act provides that a portion of the Fund, usually 40 percent, will be made available annually for needed land and water acquisitions by Federal agencies. The Bureau provides technical assistance necessary for budgeting and administering the Federal portions of the Fund.

In administering the Land and Water Conservation Fund and other programs, the Bureau gives special consideration to natural beauty and to other quality aspects of the natural environment and to the needs of growing urban populations for outdoor recreation. This is done through emphasis on natural beauty and urban needs in nationwide planning, technical assistance and reviews of statewide outdoor recreation planning, and in the administration of State, local, and Federal acquisition and development proposals under the Land and Water Conservation Fund.

In addition to these responsibilities, the Bureau does preauthorization outdoor recreation planning for Federal water projects of the U.S. Army Corps of Engineers and Bureau of Reclamation, and for certain National Park Service projects.

The Bureau determines suitability and desirability of transfer of Federal surplus property to non-Federal agencies for park, recreation, and historical monument uses. Subsequent to transfer of such property, the Bureau determines and enforces compliance with requirements of the terms of transfer.

Although the Bureau manages no outdoor recreation areas or facilities, it has worked cooperatively at every level of government to meet recreation needs and demands. This includes special studies and other joint efforts leading to proposals for new National Parks, National Recreation Areas, and National Seashores; to establish the National Wilderness System, a National System of Wild Rivers, and a Nationwide System of Trails; and to expand and improve regional, State, and local parks and recreation areas.

Additional information on the Bureau's program is available from the Regional Director, the Lake Central Regional Office, Bureau of Outdoor Recreation, 3853 Research Park Drive, Ann Arbor, Mich. 48104.

Soil Conservation Service

Reclaimed strip mining pits create new recreation areas.

In Indiana, the Soil Conservation Service of the Department of Agriculture assists individuals and communities to protect and develop privately owned land and water resources.

Most technical assistance is channeled through soil and water conservation districts. The districts are established under the Indiana Soil Conservation Districts Law and are legal

subdivisions of the State. The Soil Conservation Service helps them carry out their land and water resource programs.

District cooperators receive technical help from the SCS in developing and carrying out conservation plans to fit the specific uses and conservation needs of their land. Part of the assistance is an acre-by-acre soil survey that indicates alternative uses for each tract of the cooperator's land and the conservation treatment necessary for the uses selected by the cooperator.

Soil surveys are made by the SCS with cooperating State and local agencies. Maps from the survey are suitable for use in conservation planning of agricultural and nonagricultural land. In some urban-fringe areas special soil studies have been made for use by county or city planning commissions.

The SCS also helps local organizations carry out small watershed projects under the Watershed Protection and Flood Prevention Act of 1954. These local groups—mainly soil and water conservation districts—pay part of the cost. The projects offer opportunities for rural and urban dwellers to work together to prevent floods, to improve agricultural water management, and to develop municipal water supplies, as well as fish and wildlife and recreational resources.

A pilot Resource Conservation and Development project in southern Indiana, sponsored by soil and water conservation districts and other local organizations, is being carried out with SCS assistance. Such projects, designed to increase economic opportunities through accelerated development of land and water resources, aim to increase agricultural income through proper land use and improved land and water management; develop recreation and tourist potential; encourage conversion of cropland to other income-producing uses; and develop woodland resources.

Additional information about land and water resource development on private land can be obtained from local soil and water conservation districts or from the State office of the Soil Conservation Service, 311 West Washington Street, Indianapolis, Ind. 46204.

Office of Water Resources Research

The Water Resources Research Act of 1964, also known as Public Law 88–379, is administered by the Office of Water Resources Research (OWRR). It is one of the newest of the Federal-State programs dealing with natural resources.

The Water Resources Research Center at Purdue University is one of 51 such centers or institutes located in each State and Puerto Rico that received financial support from OWRR to promote research and training in the water resources field.

Federal funding is provided in the form of annual allotments and the Center is authorized to apply for matching grants and other financial support for specific research projects on a competitive basis. The Center has a number of projects underway. These include methods for estimating runoff from small watersheds; analysis of ground water use and replenishment; hydraulics of flow in meandering rivers with flood plains; the rate of infiltration of water into soil; and the effects of pesticide residues and other organo-toxicants on the quality of surface and ground water resources. Additional projects responsive to State needs are added when others are terminated or as funding permits.

Students, who are employed as research assistants to the well-qualified principal investigators of the approved projects, receive valuable training while performing useful research.

The Center maintains close contacts with other colleges and universities within the State having competence in water resources research and training, and keeps advised on local and State water resources research needs.

The two primary products of this program—research results and trained personnel—should be of increasing importance to effective water resources management in Indiana.

Additional information on the activities of the Office of Water Resources Research may be obtained from the Director, Water Resources Research Center, Lilly Hall, Purdue University, Lafayette, Ind. 47907.

The Future

Indiana is growing and growing fast. With the rise of the steel industry and manufacturing in the north, prosperous farms in the central part, and the potentially rich recreation areas of the south, Indiana's natural resources are continuing to make a major contribution to the progress of the Hoosier State.

What the future holds for Indiana will depend upon the use and consideration each Hoosier gives to his State's land, water, mineral, and fish and wildlife resources. The consequences of waste and ignorance—eroded soils, polluted rivers and streams, denuded forests, and scarred landscapes—are plainly evident. And yet ironically these signs of irresponsibility are often the stimulus for action.

The struggle for conservation grows more difficult each year. The increasing and sometimes conflicting demands on natural resources for industry, housing, agriculture, and recreation for a growing Indiana population make resource planning something that the pioneer could not have imagined—a vital necessity.

The Federal natural resource agencies have made significant contributions to Indiana's progress and, in the years to follow, will continue to assist Hoosiers to assure prudent use of their natural resources.

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Other Publications of Special Interest

Natural Resource booklet series: Colorado, Montana, Washington, Oregon, New Mexico, Idaho, 50 cents, each, Arizona, Massachusetts, Ohio, West Virginia, Utah, Texas, and Nevada, 45 cents each, California, 60 cents, Wyoming, South Dakota, and Alaska, 65 cents each; Conservation Yearbook Series (in full color): "Quest for Quality," $1.00, "The Population Challenge," $1.25, "The Third Wave," $2.00; "America's Department of Natural Resources," 30 cents; "Natural Resources Mission to Germany," 30 cents; "A Primer on Ground Water," 25 cents; "Has the United States Enough Water?" $2.25; "Parks for America," $5.25; "National Park Story in Pictures," 65 cents; Free List of National Parks and Monuments; "Federal Assistance in Outdoor Recreation," 35 cents; "Potomac Valley," $3.00; "Colonials and Patriots," $2.75; "Birds in Our Lives," $9.00; "Ducks at a Distance," 25 cents; "Waterfowl Tomorrow," $4.00; "Wildlife on the Public Lands," 35 cents; "The Wolves of Isle Royale," $1.00; "The Bighorn of Death Valley," $1.50; "Boundaries of the U.S. and the States," $1.75; "Mineral Facts and Problems," $6.75; "Gem Stones of the U.S.," 25 cents; "Design of Small Dams," $6.50; Free List of Test Kitchen Series; "Seafood Slimmers," 25 cents.

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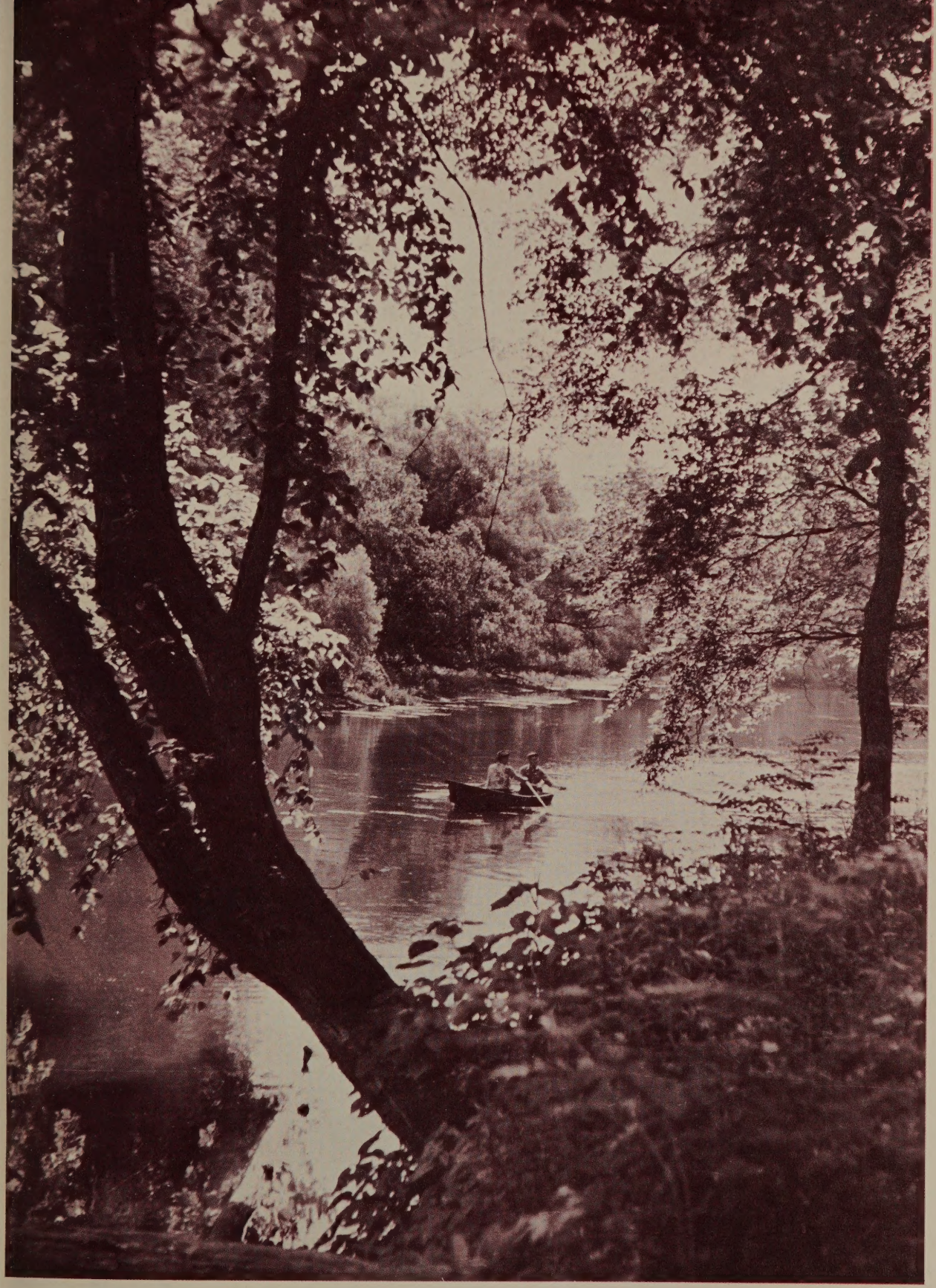

(Above) When the sun is shining and the water looks so peaceful, it's time to go fishing on the Tippecanoe River.
(Back cover) "Man can find solace and relief from the pressures of the industrial world" at the Indiana Dunes.

Created in 1849, the Department of the Interior—a Department of Conservation—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.